For those campers who have never used an Atari computer, or maybe never used a disk drive, you will need to present a basic introduction to the handling of equipment and diskettes. A review of this topic may be in order for most everyone. Once this is done, any of the following activities may be done at the beginning of camp in whatever order you like. (Also see BASIC curriculum, module 1, and PILOT curriculum.)

1. Campers should take turns playing one of the typing games available at camp. Both MASTER TYPE and TYPO ATTACK were sent in large quantities. This activity does not require an instructor's presence, but will require an introduction, and thus you may wish to use it as a "side attraction" while other activities are in progress.

2. Get the campers to run the PERSONAL program so that they might get acquainted with each other. This program can be found on the BASIC UTILITY DISKETTE. Instructions are included in this packet.

3. Teach campers (those who don't already know) how to format and write DOS to a blank diskette. They will need to do this before you can continue with the curriculum.

4. Show campers the library setup and explain the checkout system. Pass out the library cards. Stuff binders.

5. Give campers an early initial experience with the BANK STREET WRITER word processor so that they can begin to write letters home.

Other software that campers should get exposed to sometime during their stay at camp (during the teaching assistant workshops on Tuesdays) include the following:

PAINT
Home Filing Manager
Factory
Odell Lake (Elementary Biology)
Magic Melody Box
An Adventure game

Other items of interest for campers to be exposed to include:

Topo Robot
Alien Voice Synthesizer
Four Color Plotter
The camera for taking screen pictures.

INSTRUCTORS' INSTRUCTIONS FOR "PERSONAL"

Personal is actually three programs in one. Instructors will
only use the second of these three to dump the campers data
onto the main data disk and to load a random record for the
MYSTERY PERSON program. Campers will use the other two to
enter data and to search for their random person off of the
main data disk.

RUNNING THE PERSONAL PROGRAM

1. Make sure the campers' computers and disk drives are all
turned off.

2. Have them insert the ATARI BASIC Language Cartridge into
the left-hand cartridge slot in the computer.

3. Campers should now turn on their disk drives. When the
busy light goes out, have them open the disk drive door and
insert the program diskette, with the label in the lower
right-hand corner nearest them.

4. Have the campers turn their computers and T.V. sets on.

5. When the READY prompt appears on their T.V. screens, the
campers should type RUN "D:PERSONAL" and press the RETURN
key. The program will then load into computer memory and
start.

6. The campers can now use the "PERSONAL" program by
answering all of the questions with the appropriate answer,
until the screen that says "THE END" appears.

USING THE DATA DUMP ROUTINE

1. After the campers have finished entering their data they
will be instructed by the program to report to the instructor
for an introduction to some new piece of software or
hardware.

2. All of the computer screens should now read "THE END".

3. To start dumping the data for the room onto the main data
disk, press the control and 's' keys at the same time.

4. You will be prompted to insert the data disk and press
return twice. The program will then dump the campers data to
the main data disk.

5. When "Finished" appears on the screen and the busy light

goes out remove the data disk from the drive.

6. Repeat steps 3,4, and 5 until finished with the room.

7. When you are finished with the room, press the control and 'e' keys at the same time. You will be prompted to insert the data disk and press RETURN twice.

8. Repeat step 7 until finished with the room.

USING MYSTERY PERSON

1. The first thing the camper should see is the MYSTERY PERSON title followed by the words "PRESS START". To continue form here the camper must press the start button.

2. The MYSTERY PERSON program will then begin by giving each camper his/her first clue.

3. When they think they have guessed the mystery person the camper should enter the mystery persons name and type RETURN.

4. At this point the program will either let the next camper guess who their mystery person is or it will congratulate them on their correct guess.

5. If after ten clues the campers have not guessed who thier mystery person is, the program will print thier name followed by their suspect's name. After a short time a new screen saying MYSTERY PERSON will appear.

6. Because some campers may finish before others, you may wish to have them play MYSTERY PERSON again by first inserting the data disk, then by pressing the control and 'c' keys at the same time. The computer will choose another mystery person off of the data disk.

7. To stop the program just have the campers turn the computers off.

INTRODUCTION

DATABASE is a program that allows you to search the main disk database that was created with the PERSONAL program. With DATABASE you can either search the disks database or you can list it.

SEARCH DATABASE

1. Select SEARCH DATABASE from the MAIN MENU.

2. You should now be in the SEARCH DATABASE menu.

3. Position the cursor with the arrow keys, next to the headings you would like to search through.

4. Now type the asterisk 'x' to tell the computer that this is one of the headings that is to search for.

5. Repeat steps 3 and 4 until you have finished making all of your selections.

6. At this point you may either continue by pressing the START button, or return to the MAIN MENU by pressing OPTION.

7. If you press START, the computer will ask you to enter the headings it is to search for, and then to type return.

8. After you type return you will be asked if you want the computer to search for your heading or everything but your heading. What this means is if you choose to have the computer search for your heading it will do just that, search for your heading. If you choose for the computer to search for everything but your heading, it will search through the database and only look for the information that doesn't match your heading.

9. The computer will repeat step 8 until you have entered all the information for the headings that you selected from steps 3 and 4.

10. The last menu will ask you if you would like to have the people who fit your description, printed out on the printer. Choose either print or don't print with the arrow keys and then press the START button to continue.

11. You should now see your description followed by the people who match it from the database.

LIST DATABASE

1. Select LIST DATABASE from the MAIN MENU.

2. You will see a menu that looks similar to the menu for SEARCH DATABASE. The difference between the two is that this menu only allows you to make one heading choice.

3. Choose one of the headings. This heading will be what the computer will search through later in the program.

4. The next screen lets you choose between one of the following: 1. Having the computer search the database for a single letter/number. 2. Having the computer search the database between two letters/numbers.

5. Enter the letters or numbers in the next section. If you want to erase your entry press the space-bar.

6. Next the computer will ask you if you want the information printed out on the printer. You may make your choice by first moving the cursor with the arrow keys then by pressing the start button to continue.

7. The computer will now search the database through the heading you chose in step 3. It will look for a match from the entry you made in step 5. If it finds a match it will list that person's information on either the printer, the screen, or both, depending on what you chose in step 6.

HOW TO USE DATALINK

DATALINK is a program that was created to join the many
classroom database's into one main camp database.

1. To get started you will need two drives, the disks with
the classroom database on them, and the DATABASE/DATALINK
program disk which will be used to store the main database.

2. To run the DATALINK program, insert the DATABASE/DATALINK
disk into drive #1. Now type RUN "D:DATALINK" then RETURN.

3. Remove the DATABASE/DATALINK disk from the disk drive and
place the classroom database disk into drive #1, then press
return. If the file CAMPER.DAT isn't on the disk the prompt
"Insert the classroom database into drive #1" will repeat.

4. Now put the DATABASE/DATALINK disk that will hold the main
database into drive #2 and press return. If there isn't a
CAMPER.DAT file on this disk, the program will create its
own.

5. The program will now transfer the CAMPER.DAT file from
drive #1 to drive #2.

6. Next the prompt "Would you like to add another classrooms
data (Y/N)" will appear. If you wish to stop now type 'N'.
If you have more data to store in the main database then type
'Y'. The program will then repeat steps 2 through 5 until
you have finished.

DATABASE STRUCTURE

The following is a brief explanation on how the database, "CAMPER.DAT" is structured.

CAMPER.DAT is a simple database. It is not alphabetized or indexed. It contains the information which was entered with the PERSONAL program in the same format. What this means is that the information for each person on the disk is arranged in the same way as it was entered. With the persons name first followed by there address, city, state, etc... This continues until you run out of data.

Database format

Name
Address
City
State
Zip
Age
Hair color
Eye color
Sex
Favorite color
Favorite singing group
Favorite song
Favorite movie
Favorite T.V. show
Favorite food
Favorite sport
Favorite game
Favorite animal

The following is a program that will allow you to list the database.

```
10 REM ***LIST DATABASE***
20 DIM TEMP$(30):REM Each record is 30 characters long
30 OPEN #1,4,0,"D:CAMPER.DAT":REM Open file for input
40 TRAP 80
45 REM Print database
50 INPUT #1;TEMP$:REM Input record
60 PRINT TEMP$:REM Print record
70 GOTO 50:REM Repeat until end of file
80 CLOSE #1:END:REM Close file
```

OUTLINE FOR BOOK 1
ATARI SUMMER CAMP CURRICULUM 1983

SESSION	MATERIAL
1	Unit 1. General introduction.
2	Unit 1. Explore simulations.
3	Unit 2. The robot turtle and the screen turtle. Running through mazes in PILOT using GO and TURN.
4	Unit 2. Drawing with the turtle. Creating and saving abstract designs using DRAW, TURN, CLEAR, PEN COLOR, RUN, SAVE, LOAD, LIST, NEW.
5	Unit 2. Modules. Renumber your design and give it a label. Then Use it in different places on the screen and in different orientations. Do the same with other designs. Repeat one of the designs on the screen with an infinite loop.
6	The Bank Street Writer. Write a letter home, possibly including output on the printer/plotter. Continue exploration of turtle graphics.
7	Unit 3. Music composition.
8	Unit 4. Creating music phrases.
9	Explore other music software.
10	Unit 5. Text and large text.
11	Demonstrate previous student projects. Explore the voice synthesizer.
12	Unit 6. Repetition and symmetry. Squares, triangles, polygons, stars and spirolaterals.
13	Unit 6. Variables. Squares, polygons, and stars of various sizes.
14	Unit 6. Interaction. Ask questions about how big a design should be.
15	Unit 6. Square spirals. Dynamicly change the values of variables in loops to create spiral patterns and explore the use of variables.
16	PAINT. Explore the PAINT program as another approach to graphics.
17 - 18	Finish projects. Sequences of mixed graphics, sound, and text modules.

This book has been designed to introduce campers to the
computer as an artistic and expressive medium as well as a tool
for computation and information processing. It is divided into
units, each centering around a group of concepts. Some of these
concepts spring naturally from computer science, while others have
grown out of other disciplines. Many of these concepts will
reappear in later units. This is intended to let the campers
absorb new ideas gradually and see how they interact in different
contexts.

Each unit presents a series of activities through which
campers can explore applications of each concept. A rough
estimate of the time these will take is suggested at the beginning
of the unit. Challenges are presented for those who move through
the material quickly or already have some experience with the
concepts being covered. Each unit also includes teaching tips for
helping camper having difficulty.

The first two units are intended to familiarize campers with
the computer and introduce them to programming through the
creation of simple graphic designs using turtle graphics. Through
these activities the campers become familiar with the notion of a
program as a sequence of instructions stored on disk that can be
loaded into the computer and followed. Campers learn to create
their own sequences of instructions, and debug and edit them to
get the results they want. Instructions are grouped together as
modules for repeated use in varying circumstances.

Units 3, 4, and 5 cover the use of music and text in PILOT
and combine these with graphics to present short compositions. In
the process a structured approach to programming is reinforced
through the continued use of modules. Campers experience the use
of a variable in controlling the tempo at which music is played.

Unit 6, the final part of book 1, returns to graphics to
expose the campers to broader uses of variables, interaction, and
repetition. During this time campers combine what they have
learned into short projects. Throughout the curriculum campers
broaden their experience as users of the computer by writing
letters home with a word processor, creating their own music and
art with various software packages, and exploring peripheral
devices including a voice synthesizer, a plotter, and a robot
turtle.

Book 1 Utility Disk Directory and Description

This disk contains Atari Computer Camp Book 1 Curriculum software and program examples. This disk is not to be duplicated and is to be used only with Atari Computer Camp curriculum and as such is to be kept confidential. The programs on the disk are written in PILOT II.

SOUNDEMO, MAZE1A, MAZE1B, MAZE2A, MAZE2B, and STRUM are specific curriculum related software.

DESIGN, PICTURE, ARC, SONG, SHOW, HUSTLE, CLOSER, HUSTLER, SPIRO, SPIROS, STARS, SQUIRAL, and SPIRSQUI are examples of programs that can be created with the curriculum activities.

VICKY, LAURA, ART, WEB, LESLIE, TRIANGLE, BUBBLE, ROCKET, ZOLTAR, SPSHIP, and MASTER are examples of projects done by previous students.

	PILOT	BASIC
To save to the disk	SAVE D:NAME	SAVE"D:NAME
To run a program from disk	RUN D:NAME	RUN"D:NAME
To load from the disk	LOAD D:NAME	LOAD"D:NAME
To list to the printer	SAVE P:	LIST "P:
To save a piece of a program	SAVE D:NAME line#,line#	LIST "D:NAME", line#, line#
To retrieve same piece	MERGE D:NAME ` or APPEND D:NAME (APPEND renumbers the appended program to follow the current program.)	ENTER"D:NAME" (ENTER merges the text with the current program.)

To use the Epson printer for (picture) screen dumping the computer must be turned off, insert the macrotronics disk, turn on the computer, when question is asked PRINTER (0-4)? type 3. Remove disk and load the program you wish to copy. When picture is on screen and stopped on screen, type CTRL P.

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Book 1 Unit 1   Introduction to Campers and Computers

Time - 2 session

Key Concepts

        Introduction to the computer
        Introduction to instructors
        Introduction to each other

Prerequisites

New Statements

        LOAD
        RUN
        NEW

Materials

        Personal program disks
        BASIC cartridges
        Notes to the Instructors
        Computer Novices information sheet
        Instruction sheet for personal and mystery person data
             base
        Control Graphics Keyboard Picture

Book 1   Unit 1

Activity Outline

1.   Instructors should introduce themselves to the
     campers in the class.

2.   Cover the material in the Computer Novice insert.

3.   Have campers insert ATARI BASIC cartridges into
     their computers and then RUN the PERSONAL program
     on the Personal program disk. Follow the
     instructions on the personal program instruction
     sheet for using the PERSONAL and MYSTERY PERSON
     program.

4.   Explore the simulations Odell Lake and Factory.
     Explore adventure games.

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Book 1   Unit 1

Challenges

Explore more adventure games.

Teaching Tips

Be sure to emphasize the use for the RETURN key.

COMPUTER NOVICES

PURPOSE: To introduce computer novice campers to the microcomputer with 'hands-on' experience as quickly as possible.

Day 1-(1 hour session)

Tell campers a little about the microcomputer.

a) Identify the hardware pieces, especially explain that the 'computer' is in the plastic case with the keyboard.

Show a chip and poster of enlarged circuitry. Explain that this development is what makes the microcomputer so small.

b) Talk about the ENIAC. The ENIAC was developed in 1947, it was the size of six large school buses and broke-down every 15 minutes. The Atari micros used at camp are more powerful and (do not break-down) are more reliable.

Have computers and peripherals hooked-up, with BASIC cartridge at hand for campers to insert into left-slot of opened door on computer.

Explain that this cartridge is used in the computer when we want to use a computer language. The one we will be using today is BASIC an acronym BASIC = Beginners All-purpose Symbolic Instructional Code.

Other languages will be used throughout the camp experience.

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Show a disk and a tape. Explain that these are used to save the set of instructions given to a computer (called a program) to make it perform specific tasks.

Give specific instructions on the proper handling of disks and tapes. (Don't touch oval opening of disks, take care about setting disks or tapes near magnets. There are magnets in the monitor, the power supplies, and the telephone.)

Have campers insert BASIC cartridge into left-hand slot of computer.

BOOT COMPUTERS

a) Everyone insert disks (push button to open door, pick up disk with oval cut away from you, slide in until disks stops, close door).

b) turn on the disk drive by pushing the switch on the front of the drive (two red lights come on, whirring sound is heard and then stops).

c) turn computer on by pushing switch on the right side of the computer — there are two switches on the right, one to turn the computer on or off — one to change the T.V. choice when using a T.V.

d) turn on monitor

e) describe what is happening; be sure to mention that this action is called booting the disk.

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COMPUTER NOVICES

Spend the next few minutes (estimate 15) exploring the keyboard.

a) type in the word BYE - press return (the user must press RETURN whenever they are finished typing a command). The screen should say ATARI MEMO PAD. Explain the use (job) of the cursor.

b) type in own name (keyboard is same as a typewriter with a few additional special keys)

c) introduce back space key - use for erase

d) introduce upper/lower key uses

e) introduce CTRL key for keyboard graphics

f) introduce CTRL to move cursor without erasing

g) introduce ATARI key for reverse video

h) draw a picture using the graphic control characters

10

CONTROL GRAPHICS KEYBOARD

11
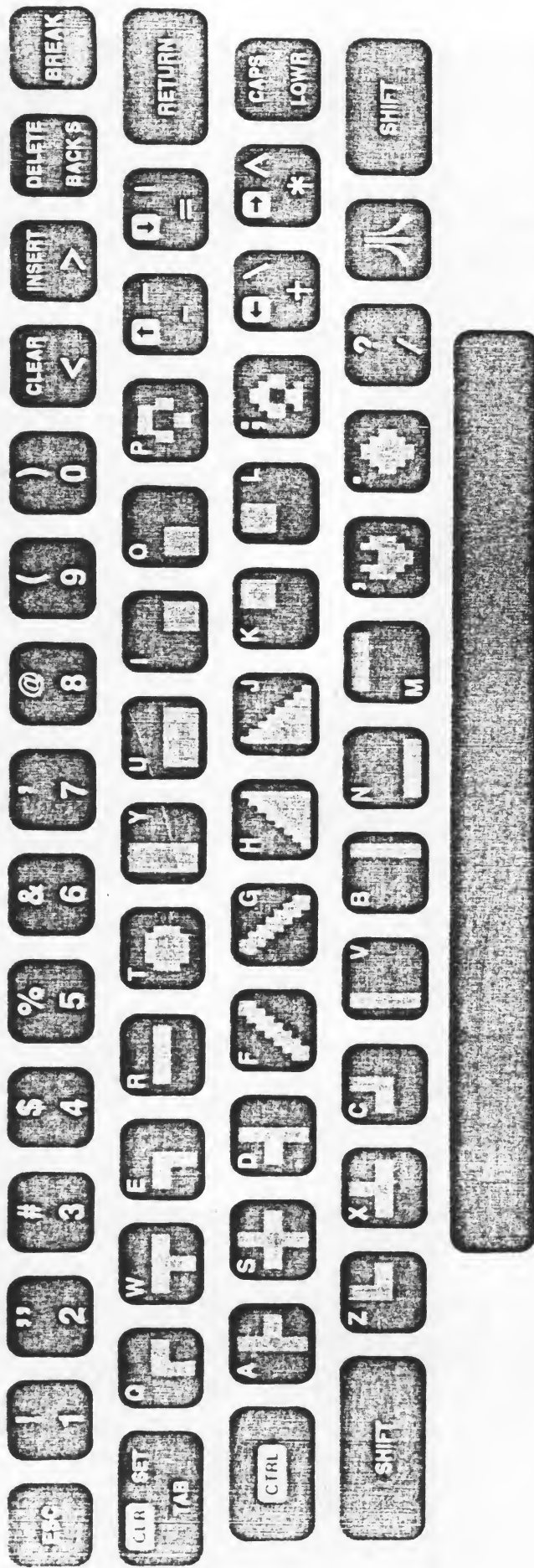
Book 1   Unit 2   Introduction to turtle graphics
Estimated time: 3-4 sessions

Key Concepts
      A program as a sequence of instructions
      Relative and absolute trutle instructions
      Angles
      Modules

Prerequisites
      General knowledge of keyboard
      Knowledge of LOAD, RUN, and NEW statements

New Statements
      GO   TURN   DRAW   GOTO   TURNTO
      U:*NAME   CLEAR   PEN COLOR   PEN UP   PEN DOWN
      J:*LABEL   E: SAVE   LIST   REN·

Materials
      PILOT Disk: MAZE1A, MAZE1B, MAZE2A, MAZE2B
      Robot turtle and maze
      Turtle drawing worksheet
      Atari PILOT grid sheets

Book 1   Unit 2

Activity Outline
1.   Use the robot turtle to illustrate relative motion
      in a physical context with the GO and TURN
      commands. Build a maze and have the group navigate
      the robot through it.
2.   Have each camper run a screen turtle through a maze
      using GO and TURN.
3.   Have the campers explore what images can be created
      using DRAW, GO, and TURN with the screen turtle.
4.   Introduce the idea of a stored program. Have each
      camper create a short program to draw a small
      design and save it on their disk.
            Example: DESIGN
5.   Give the design a *label and then use GOTO and U:
      to place the design in different places on the
      screen. Also explore different orientations and
      the use of TURNTO.
            Example: PICTURE
6.   Use the Turtle Drawing worksheet to further explore
      drawing with the turtle. As campers run into
      difficulty drawing these images, introduce simple
      debugging and editing notions. In particular have
      them try walking trhough their instructions as if
      they were the robot turtle, telling their
      instructions to a friend to trace through, and
      using the START key to step through a program.
7.   Show campers how to repeat one of their designs on
      the screen with an infinite loop.
            Example: ARC
8.   Use the 1020 Printer/Plotter to display the
      camper's graphic designs and dump listings to it
      and other printers.

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Book 1   Unit 2

Challenges
   1.   Try mazes with acute and obtuse angles. Try
        drawing mazes for each other to follow.
   2.   Make more involved designs using modules within
        modules.
   3.   Experiment with different colors for pens and for
        the screen background. Experiment with FILL,
        SHADE, and PEN ERASE. Experiment with SPEED:.
        Make a design change colors or flash on and off.
   4.   Experiment with different modes and with full or
        split screen. Change colors using SETCOLOR.

Teaching Tips
   1.   For campers having difficulties with angles it
        might be easiest to work only with right angles at
        first.
   2.   Using negative values after TURN for left turns may
        make them easier to understand.
   3.   Some campers may have difficulty with negtive
        numbers and coordinates. A little practice finding
        points on the Atari Pilot grid sheets should help.
   4.   Using negative values with DRAW and GO may make it
        easier to draw some figures on the worksheet like Y
        and E.
   5.   If campers get stuck have them play turtle by
        putting themselves in the turtle's position and
        orientation and figuring out in terms of their own
        bodies how far to turn and in which direction.
   6.   Using DRAW and GO to draw figures that
        close can be quite difficult. Campers
        trying to draw block letters may find it
        helpful to draw a grid over the letter to
        make it easier to determine relative
        lengths.

Cross Reference
   A.   Manuals: Student PILOT pages 17-18, 26-29, and 55-83
                   PILOT Primer pages 55-56, 95-98, and 115-138
   B.   Books: Picture This
                   Turtle Geometry

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CONFIDENTIAL

ATARI

15
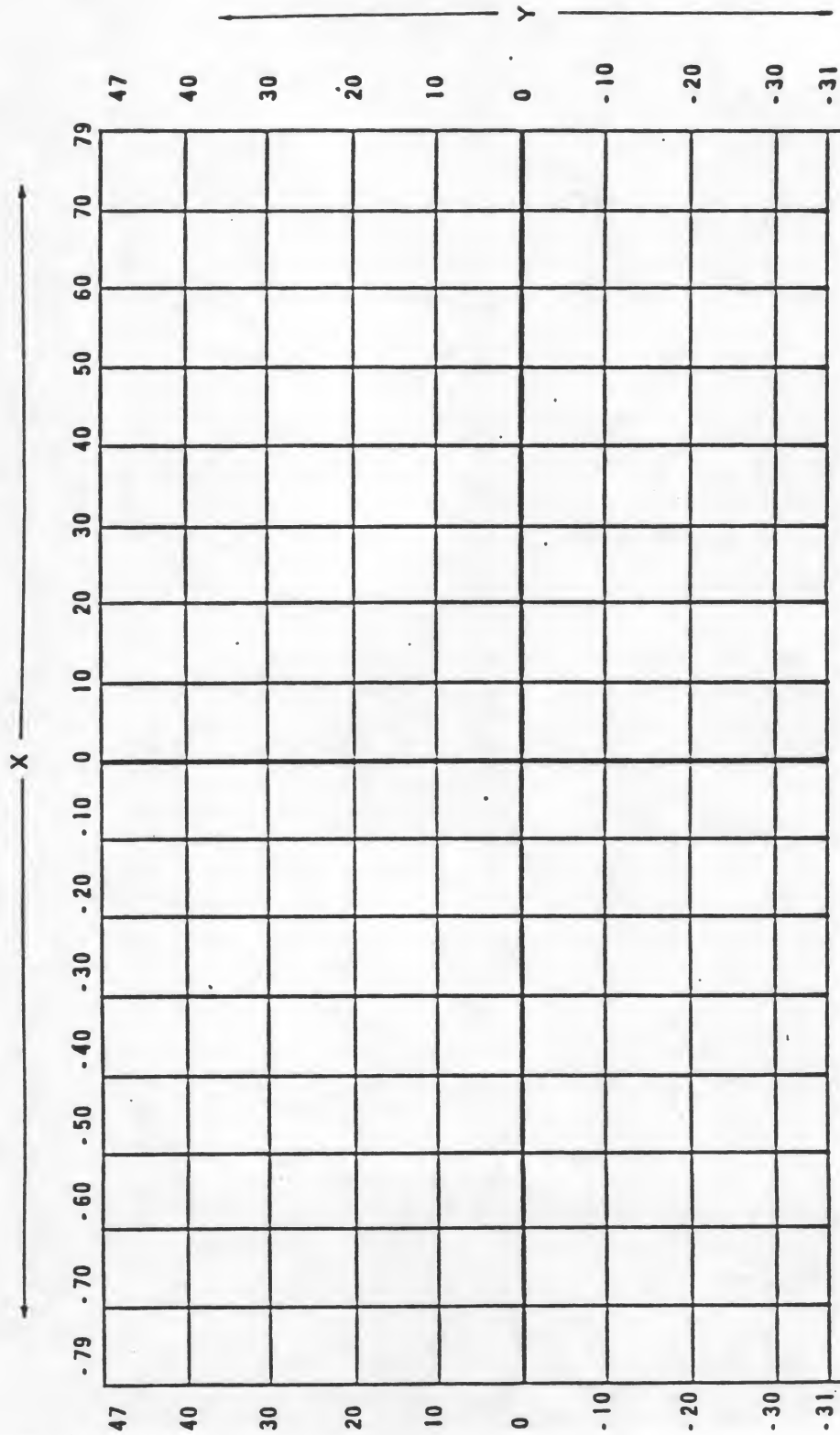
Here are some shapes to try to draw:

Letters:

L N W S T E Y K

Symbols:

Block letters:

T F X

Challenges:

Book 1   Unit 3   MUSIC COMPOSITION
Estimated Time: 1 session
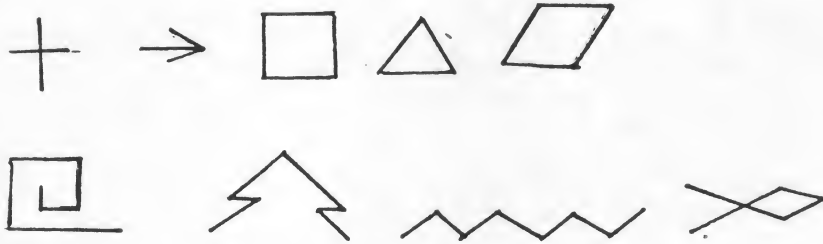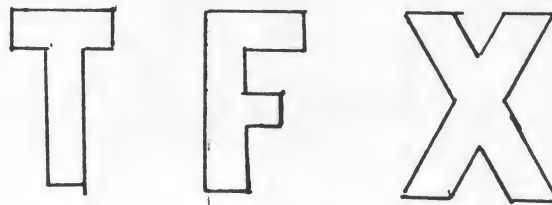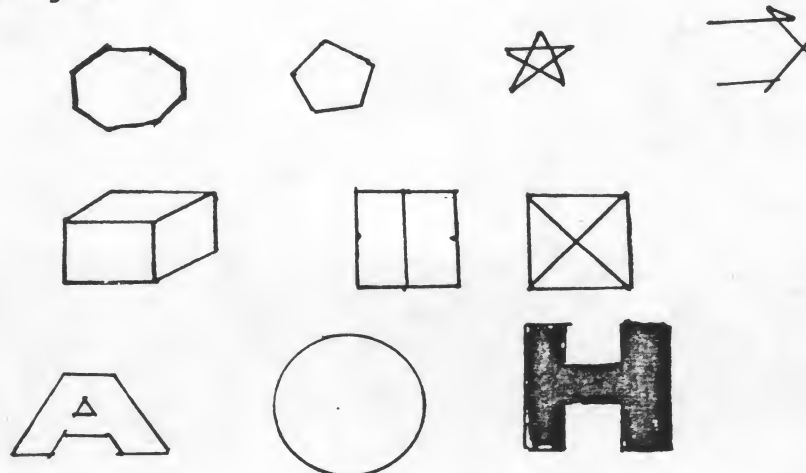
Key Concepts:

        Organization of phrases in musical composition

        Tempo of musical phrases

        Changing the value of a variable

        Sound effects

Prerequisite Statements:

        U:*NAME   NEW   LOAD   LIST   RUN
        E: SAVE

New Statements: Examples:

        C:#T   C:#T=5

Materials:

        PILOT Utility Disk: SOUNDEMO

        PILOT Cartridge

        Introduction to Sound worksheet

Book 1   Unit 3

Activity Outline:

1. Introduction to sound worksheet.

2. Encourage campers to edit the programs they create.
   Some may want to assemble Yankee Doodle. Others will
   prefer to create their own compositions. Both approaches
   are fine. Encourage them to explore how different phrases
   sound next to one another.
        Example: SONG

3. While exploring different tempos be sure to try some
   fast tempos. Setting #T=2, 1, or 0 will tend to play
   interesting sound effects.

Challenges:

1. Explore the effects of changing tempo within a song
   (between modules.)

2. Encourage the building of modules that use other modules.
   For example:
```
            *WHIZ
                C:#T=1
                U:*UP
                U:*TRILL
                U:*DOWN
                E:
```
   creates an interesting sound effect.

Teaching Tips:

1. The concept of a variable can be difficult to understand
   the first time it is encountered. Let the campers experiment
   with setting #T and noticing the effect before explaining
   the use of this variable in the sound modules. Theoretical
   explanations of variables in general should wait until campers
   encounter other uses of variables in modules 7 and 8.

2. Some campers may create loops by calling a module they are
   currently in. For example:
```
                *WHIZ
                  U:*UP
                  U:*WHIZ
```
   (or including U:*WHIZ as part of *UP.)
   These are both examples of recursion which is not
   supported by PILOT and will result in a U: TOO DEEP
   error after a few loops. Do not intensionally direct
   kids into this, but if it happens have them trace through
   the program to see what is happening. Each time PILOT
   executes a U: statement it must remember where to return
   to. While using *TRILL as part of *WHIZ above it must
   remember where to go after *TRILL and where to go after
   the E: in *WHIZ. In a recursive loop it has to keep
   remembering more places to return to. PILOT will only
   remember twenty four places at one time.

Cross Reference:

A. Other Modules:
B. Software: Music Composer also allows you to explore
   changes in tempo and the order of musical phrases.
C. Manuals: PILOT Primer   page 105
              Student PILOT   page 85

INTRODUCTION TO SOUND

LOAD D:SOUNDEMO (To LOAD a program from the disk - insert
the disk into the drive $\sqrt{\ }$ if drive is off turn on drive, then turn
on the computer $\sqrt{\ }$ first type NEW and press the RETURN key,
next type LOAD D:SOUNDEMO and press the return key).

You will be experimenting with sound and the computer.
- The program that you have LOADed into the computer has several
modules preprogrammed for you to use.

To use these modules you must give the computer a command
that will assign a length of time for each note to be held.
This is done by using the Compute command which will assign a
length of Time for the PAuse. The prodedure is as follows:

C:#T=

Any number may be added to this equation. Try 12 to start.

Using the immediate mode try the following:

C:#T=12
U:*UP
U:*PONY
U:*TRILL

Now try these other sounds:

*UPDOWN
*RONI
*CHEESE
*DOWN
*TUNA

Put several modules together in a short program.

For example: 10 C:#T=12
                    20 U:*UP
                    30 U:*TRILL
                    40 U:*DOWN
                    RUN

Try changing the tempo like this:

10 C:#T=7

Try other numbers for tempo.

20

Book 1   Unit 4   CREATING MUSIC PHRASES
Estimated Time: 1-2 sessions

Key Concepts:

    Timing

    Pitches, notes, and chords

    Repetition and infinite loops

Prerequisite Statements:

U: *NAME	CLEAR	FILL	NEW	RUN
C: #T=	GO	PEN COLOR	LOAD	SAVE
E:	DRAW	TURN	TURNTO	LIST
J:	GOTO			

New Statements: Examples:

  SO: SO:20

  PA: PA:50

  REN   REN

Materials:

    PILOT Utility Disk: STRUM

    PILOT Cartridge

    Writing your own tunes worksheet

    Copies of PILOT Primer pages 105-109

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Activity Outline:

1. Writing your own tunes worksheet.

2. Help campers create their own phrase modules. Direct
   campers familiar with music to PILOT Primer pages 105-109.
   A group of campers may want to split up the task of
   entering a song by each writing one phrase.

3. After their song programs are running show campers how
   to play a song indefinately using J: to create an infinite
   loop.
        Example: HUSTLE

4. Try using several computers at once to play music together
   as a group. For example, a program could be written to play
   a round such as Row, row, row your boat. Then several machines
   could be loaded with the program and each one could start playing
   when the machine next to it started on its second phrase.

5. Help students integrate sound and graphic components into one
   program. Saving and renumbering parts of a program may be needed
   at this point.
        Example: SHOW

Challenges:

1. Encourage campers to use #T instead of constants in
   the PAuse statements in their phrase modules so the
   phrases can be played at different tempos. Computation
   can be used in the pause statement to get notes of different
   lengths.
2. Explore relative musical notation and combined note and
   duration in one statement.

3. Interesting beats can be created using sound effects
   seperated by PAuses.

4. Some campers may want to explore putting various guitar
   chords together for songs. The STRUM program on the PILOT
   utility disk may be of interest to these campers.

Teaching Tips:

1. It will be hard in general for campers with limited
   musical experience to create pleasant sounding chords
   and songs without extensive and perhaps frustrating
   experimentation. After some brief exploration of notes
   they may prefer to explore more sound effects or timing
   applications to go with their graphics. Interesting
   rythms can be explored by alternating brief notes with
   PAuses of various lengths and repeating with J:. Other
   interesting sound effects can be created by playing two
   consecutive notes, SO:2,3 for example.

2. Some campers may have problems getting songs with notes
   of different lengths to sound right at different tempos.
   Changes in tempo should involve proportional changes
   in the duration of notes. This means that all durations
   (i.e. PAuses) should be represented as multiples of
   the basic tempo unit #T.

	PA:20		PA:#T*2
	SO:14		SO:14
Thus,	PA:40	should be changed to	PA:#T*4
	SO:12		SO:12
	PA:10		PA:#T

   Using addition, subtraction, division or modulo may
   produce interesting results but will not effect proportional
   changes when #T is changed.

Cross Reference:

A. Other Modules:
B. Software: Music Composer can be useful in creating your
   own sounds and rythms.
C. Manuals: PILOT Primer   page 105
             Student PILOT   page 85

Book 1   Unit 5   PILOT Music, Text and Graphics

Estimated Time — 1-2 class.sessions

Key Concepts
      Putting music, graphics and text together

Prerequisites
      LOAD   RUN   NEW
      U: GOTO   PEN COLOR
      E: C:#T   TURN
      SAVE   GO   TURNTO
      DRAW   FILL   LIST
      SO: PA: CLEAR

New Statements   Examples
      T: T:Try typing this statement.
      A: wait until user responds
      LETTERS: LETTERS:LARGE

Materials

      PILOT cartridge

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Activity Outline

1. Campers will add a short story to their previously
   programmed music/graphics program. Using A: to
   keep text on the screen until user wishes to move
   ahead.
         Example: HUSTLER
   Some campers may find it fun to create programs like
   HUSTLER for the robot turtle.

2. Add title pages to the stories using LETTERS:LARGE..
         Example: CLOSER

3. Music, graphics and text should be intertwined.

4. At this point campers are ready to start creating larger
   projects combining sound, text, and graphics. They will
   continue working on these projects through the rest of
   this book. The following examples created by previous
   students can be used to help stimulate their imaginations.
         LESLIE
         TRIANGLE
         VICKY
         LAURA
         BUBBLE
         ROCKET
         ZOLTAR
         SPSHIP
         MASTER

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Challenges

1. Have the campers create pictures on the screen using T: and character graphics.

2. Explore the patterns that can be created on the screen by printing graphics characters in an infinite loop. For example:

```
                    *PATTERN
                T:      /\
                J:*PATTERN
```

Have the campers try to figure out how to create some of these designs!   (possible solutions)

diagonal lines

diagonal lines
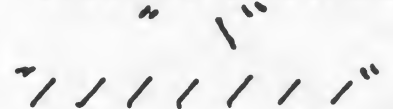
boxes

square waves

boxes with circles

square wave pattern

Teaching Tips

1. PILOT avoids breaking words when using the T: command. A \ may be used to continue text on on the same line.

Cross Reference

Student Reference Guide pages 8-11
PICTURE THIS!, David Thornburg,
    pages 105 - 106

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Book 1   Unit 6   Turtle Graphics

Estimated Time: 4-6 sessions

Key Concepts
        Repetition and symmetry
        Variable size and position, proportion
        Interactive programming
        Dynamic use of variables

Prerequisite Statements:
        U:*NAME   E: J:*LABEL   C:#T   T:
        A: TURN   GO   DRAW   GOTO
        CLEAR   TURNTO   LOAD   SAVE   LIST
        RUN   NEW

New Statements   Examples
        Repetition   5(DRAW 10;TURN 36)
        C: C:#S=20,   C:#S=#S+1
        A:#S   A:#S

Materials
        PILOT
        Drawing Stars and Polygons worksheet

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Book 1   Unit 6

Activity Outline

0.   These activities give the campers a brief exposure
       to several important concepts. Time should be
       allotted between the parts of the activity for the
       campers to absorb and experiment with the ideas and
       incorporate them in their projects.

1.   Have the campers individually or as a group show
       you how to draw a square. Then point out the
       repeated use of the same instructions and introduce
       graphic repetition in PILOT. For example, 4(DRAW
       15;TURN 90).   Then have the campers create modules
       of their own using repetition. Encourage them to
       explore the effects of repeating different turtle
       commands. Once they have a module they like have
       them create designs by using the module at
       different places and orientations on the screen.
              Example: SPIRO

2.   Write down a module to draw a square:
                  *SQUARE
                     4(DRAW 15;TURN 90)
                     E:
       and ask the campers what to change to make a
       smaller square. Point out that the 15 in the above
       module determines the size of the square and try
       changing it to #SIZE. Then use C:#SIZE= and
       U:*SQUARE to draw squares of a couple different
       sizes. Have the campers use GOTO, C:#SIZE=, and
       U:*SQUARE to see what they can represent on the
       screen using only squares of different sizes. Then
       have them incorporate a size variable in the
       modules they created before and see what they can
       create on the screen using only that module with
       different sizes, positions, and orientations.
              Example: SPIROS

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3. Have campers incorporate interaction in their
    programs letting the position and size of their
    shape be determined at run time. First demonstrate
    how the value of #SIZE can be set with A:#SIZE like
    this:

```
            *QUESTION
                T:WHAT SIZE SHAPE DO YOU WANT?
                A:#SIZE
                U:*SHAPE
                J:*QUESTION
```

    Then have the campers incorporate this in their
    programs and figure out how to ask for position as
    well.

            Example: STARS

4. With the class as a whole take another look at
    polygons and stars with this program:

```
                10  PEN YELLOW
                20  C:#SIZE=20
                30  *AGAIN
                40     DRAW #SIZE
                50     TURN 90
                60     J:*AGAIN
```

    Have the class experiment with changing the amount
    the turtle turns and have them discuss which values
    give the simplest results. After experimenting
    with this for a while show them what happens when
    you change the length of a side dynamicly like
    this:

```
                55  C:#SIZE=#SIZE+1
```

    Then let them experiment with different spiral
    patterns that can be generated this way.

            Examples: SQUIRAL
                       SPIRSQUI

5. Encourage the campers to incorporate some of these
    ideas into their projects.

            Examples: ART
                       WEB
                       MASTER

Book 1   Unit 6

Challenges

1.   Have several students make up repeated patterns.
      Draw the patterns on the plotter. Have the
      students trade patterns and try to figure out what
      is being repeated and how the pattern was
      generated.

2.   More complex patterns can be created by "nesting"
      repetition. For example
            4(GO 5;3(DRAW 20;TURN 120);TURN 90).

3.   Try negative values for size. Give campers the
      Drawing Stars and Polygons worksheet.

4.   In experimenting with spiral patterns try using
      several DRAWs and TURNs. For example try changing
      line 40 in the activity outline program to
            40 DRAW #SIZE;TURN 30;DRAW #SIZE;TURN -30;
               DRAW 2*#SIZE

5.   Try experimenting with dynamicly changing the size
      of the angle. For example change the program in
      the activity outline as follows:
            50   TURN #ANGLE
            55   C:#ANGLE=#ANGLE+1

Teaching Tips

1.   One interesting class of repeated patterns is
      spirolaterals. These are formed by always turning
      the same amount. For example
            4(DRAW 9;TURN 90;DRAW 2;TURN 90;DRAW 5;
               TURN 90;DRAW 3;TURN 90;DRAW 1;TURN 90)

2.   If campers get confused by the variable #SIZE have
      them make different sized squares directly for a
      while:
            4(DRAW 8;TURN 90)
            4(DRAW 25;TURN 90)
      Let campers get comfortable with how changing the
      amount you draw affects the size of the square
      before generalizing this with the variable #SIZE.

3. Pictures with sides of different lengths will need
    to change proportionally when they are drawn in
    different sizes. This means that each DRAW
    statement should be followed by a multiple of
    #SIZE. For example, the block F in Unit 2 might
    start with DRAW #SIZE*5;TURN 90;DRAW #SIZE*3. Some
    campers may have a problem with this. Let them
    experiment with several solutions before helping
    them focus on multiplication as a useful approach.

4. In part 3 of the activity the question about where
    the shape should go should be split into two
    questions; how far over, and how far up.

5. If campers are confused by how the spiral patterns
    work, try stepping through the program with the
    START key. This will allow you to see how the
    lines get longer as #SIZE changes. The value of
    #SIZE can be checked anytime by typing T:#SIZE.

6. It is not expected that the campers will have a
    complete understanding of all these concepts at the
    end of two weeks. Many of them will not even be
    able to begin to solve the problems in the
    challenges. However, through these exercises they
    can begin to explore the asthetic capabilities of
    the computer, much as an artist can explore
    acrylics without understanding the chemistry of how
    they work. They can also begin to appreciate the
    power that is achieved through the repetition of
    simple instructions and the manipulation of
    variables. Further adventures in programming
    should help them learn to harness some of this
    power. At this stage the primary objective is to
    explore the effects of this power and begin to
    grasp some of the rudimentary operations behind it.

Cross Reference

A. Other Units: 2   Turtle Graphics
                    4   Proportion and variables

B. Manuals: PILOT Primer   pages 115-138
                Student PILOT   pages 55-83

C. Books   Picture This
                Turtle Geometry

DRAWING STARS AND POLYGONS

This program draws a hexagon:

```
*HEX
         GR: 6(DRAW 20; TURN 60)
         E:
```

What happens if we change TURN 60 to TURN #A?

Make the change and then try some different angles like this:

```
GR:CLEAR
C:#A=50
U:*HEX
```

After you have experimented with several angles try to write modules to draw some of these figures:
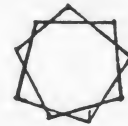
Extra challenges:
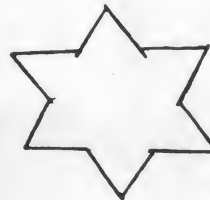
```
 10 PEN YELLOW
 20 GOTO 20,5
 30 U:*DESIGN
 40 U:*DESIGN
 50 U:*DESIGN
 60 U:*DESIGN
 70 GOTO -15,-20;NORTH
 80 U:*DESIGN
100 GOTO -60,-20;NORTH
110 *REPEAT
120    U:*DESIGN
130    TURN -85
140    GO 1
150    J:*REPEAT
200 *DESIGN
210    DRAW 10
220    TURN -20
230    DRAW 3
240    TURN -20
250    DRAW 3
260    TURN -120
270    DRAW 3
280    TURN -20
290    DRAW 3
300    TURN -20
310    DRAW 3
320    TURN -50
330    DRAW 3
340    TURN -20
350    DRAW 3
390    E:
```

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```
 10 *SQUIRAL
 20 CLEAR;GOTO 0,0;TURNTO 0
 30 C:#SIZE=0
 40 T:WHAT ANGLE WOULD YOU LIKE?\
 50 A:#ANGLE
 60 GR:PEN RED
 80 *DRAWLINE
 90 GR:DRAW #SIZE;TURN #ANGLE
100 GR:DRAW #SIZE;TURN 90
110 C:#SIZE=#SIZE+1
120 J:*DRAWLINE
130 E:
```

```
 10 U:*INTRO
 20 U:*BUBBLEMAN
 30 U:*BUBBLES
 40 U:*CAN
 50 U:*SOUNDS
 60 E:
 70 *SOUNDS
 80 C:#Q=40
100 SO:13,25
110 T:HELLO,MY NAME IS MR.BUBBLE.
120 PA:#Q
130 SO:15,27
140 T:I AM HERE TO TELL YOU ABOUT BUBBLE JUICE.
150 PA:#Q
160 SO:29,17
170 PA:#Q
180 SO:15,27
190 PA:#Q
200 PA:100
210 SO:17,29
220 PA:100
230 T:THIS DELICOUS,NUTRICOUS,BAMBICOUS,TASTE WILL KNOCK YOU OUT
240 PA:200
250 PA:#Q
260 SO:18,30
270 T:SO
280 PA:#Q
290 SO:17,29
300 PA:#Q
310 SO:18,30
320 T:BUBBLE JUICE
330 PA:#Q
340 SO:20,32
350 PA:#Q
360 SO:18,30
370 PA:#Q
380 T:BUBBLE JUICE
390 SO:17,29
400 PA:#Q
410 SO:15,27
420 T:YOU'LL LOVE THE TASTE OF BUBBLE JUICE.
425 PA:#Q
430 PA:#Q
440 SO:13,25
450 T:ITS DELICOUS!
460 PA:#Q
465 PA:#Q
470 E:
590 *INTRO
600 LETTERS:LARGE
```

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```
 600 LETTERS:LARGE
 605 T:
 610 T:THE BUBBLE JUICE
 620 POS:3,4
 630 T:COMMERCIAL
 640 PA:150
 645 LETTERS:SMALL
 650 E:
 670 *BUBBLES
 680 PENRED
 690 GOTO-20,-30
 700 U:*MEDIUMCIRCLE
 710 PENBLUE
 720 GOTO -60,40
 730 PEN YELLOW
 740 U:*MEDIUMCIRCLE
 750 GOTO -30,30
 760 U:*MEDIUMCIRCLE
 770 PEN RED
 780 GOTO-60,20
 790 U:*MEDIUMCIRCLE
 800 PENBLUE
 810 GOTO -30,10
 820 U:*MEDIUMCIRCLE
 830 PENYELLOW
 840 GOTO -40,30
 850 U:*MEDIUMCIRCLE
 855 E:
 860 *MEDIUMCIRCLE
 870 GR:40(DRAW1;TURN20)
 880 E:
 890 *CAN
 895 TURNTO 0
 900 GOTO -70,-30
 910 DRAWTO-70,-30
 920 GOTO-70,-30
 930 DRAWTO-50,-30
 940 GOTO -50,-30
 950 DRAWTO-50,0
 960 TURN 210
 970 25(DRAW1;TURN5)
 975 TURN45
 980 30(DRAW1;TURN5)
 990 GOTO -70,0
1000 DRAWTO-70,-30
1010 E:
1020 *BUBBLEMAN
1025 PEN YELLOW; TURTLE OFF
1030 U:*BUBBLE
1040 GOTO 11,30
1050 U:*HEAD
1060 GOTO 39,0
1070 U:*OVAL
1080 GOTO -28,0
1090 TURN 90
1100 U:*OVAL
```

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```
1100 U:*OVAL
1110 GOTO 10,-16
1120 TURN 180
1130 U:*OVAL
1140 GOTO 30,-16
1150 TURN 90
1160 U:*OVAL
1170 *EYES
1180 GOTO 20,35
1190 100(DRAW1;TURN35)
1200 GOTO 16,32
1210 TURN3
1220 100(DRAW1;TURN35)
1230 *NOSE
1240 GOTO 19,30
1250 DRAW 2
1260 TURN -90
1270 DRAW 2
1280 *MOUTH
1290 GOTO 16,26
1300 TURNTO135
1310 DRAW2
1320 TURNTO 90
1330 DRAW 4
1340 TURNTO45
1350 DRAW2
1360 E:
1370 *BUBBLE
1380 120(DRAW1;  TURN3)
1390 E:
1400 *HEAD
1410 110(DRAW1;  TURN7)
1420 E:
1430 *OVAL
1440 30(DRAW1;  TURN3)
1450 TURN90
1460 30(DRAW1;  TURN3)
1470 E:
```

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```
12 POS:6,2
14 T:CLOSER
16 POS:9,5
18 T:AND
20 POS:8,8
22 T:CLOSER
30 SO:13
32 PA: 5
34 SO:0
36 PA:5
40 SO:13
42 PA:40
44 SO:0
46 PA:80
48 LETTERS:SMALL
50 PEN YELLOW
52 C:#T=40
54 U:*SHOW
60 PEN RED
62 C:#T=15
64 U:*SHOW
70 PEN BLUE
72 C:#T=5
74 U:*SHOW
80 GOTO 0,100
82 PA:15
84 SO:0
86 T:THEY'RE GONNA GET YA!!
87 PA:60
88 T:PRESS RETURN.
90 A:
92 U:*FLASH
94 LETTERS:MEDIUM
96 POS:5,8
98 T:GOT YA!
99 PA:120
100 E:
110 *SHOW
112 GOTO 0,0
120 U:*DESIGN
122 SO:15
124 PA:#T
130 GOTO 20,30
140 U:*DESIGN
142 SO:17
144 PA:#T
150 GOTO -15,-10
160 U:*DESIGN
162 SO:13
164 PA:#T
170 GOTO 40,-20
180 U:*DESIGN
182 SO:5
184 PA:#T
190 GOTO -50,10
192 U:*DESIGN
194 SO:8
196 PA:#T
198 E:
```

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```
200  *DESIGN
210    DRAW 10
220    TURN -20
230    DRAW 3
240    TURN -20
250    DRAW 3
260    TURN -120
270    DRAW 3
280    TURN -20
290    DRAW 3
300    TURN -20
310    DRAW 3
320    TURN -50
330    DRAW 3
340    TURN -20
350    DRAW 3
360    TURN -90
390    E:
500  *FLASH
510    FULL
512    PA:#T
520    BACKGROUND PURPLE
522    PA:#T
530    BACKGROUND BLUE
532    PA:#T
540    BACKGROUND RED
542    PA:#T
550    BACKGROUND ORANGE
552    PA:#T
560    BACKGROUND YELLOW
562    PA:#T
570    BACKGROUND BEIGE
572    PA:#T
580    BACKGROUND GOLD
582    PA:#T
590    BACKGROUND BROWN
592    PA:#T
600    BACKGROUND PINK
602    PA:#T
610    BACKGROUND LAVENDER
612    PA:#T
620    BACKGROUND GRAY
622    PA:#T
630    BACKGROUND SILVER
632    PA:#T
640    BACKGROUND WHITE
642    PA:#T
650    E:
```

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```
200 PEN YELLOW
210    DRAW 10
220    TURN -20
230    DRAW 3
240    TURN -20
250    DRAW 3
260    TURN -120
270    DRAW 3
280    TURN -20
290    DRAW 3
300    TURN -20
310    DRAW 3
320    TURN -50
330    DRAW 3
340    TURN -20
350    DRAW 3
```

```
 10 C:#T=5
 15 *REPEAT
 20   U:*THEME
 30   U:*THEME
 40   U:*SLOWNOTES
 50 J:*REPEAT
 90 E:
100 *THEME
120    U:*PHRASE1
130    U:*PHRASE2
140    U:*PHRASE1
150    U:*PHRASE2
160    U:*PHRASE3
170    U:*PHRASE3
180    E:
500 *PHRASE1
510    SO:15
512    PA:3**#T
520    SO:-2
522    PA:3**#T
530    SO:+2
532    PA:3**#T
540    SO:-2
542    PA:3**#T
550    SO:+2
552    PA:2**#T-1
554    SO:0
556    PA:1
560    SO:15
562    PA:#T
570    SO:-2
572    PA:3**#T
580    SO:+2
582    PA:3**#T
590    SO:+3
592    PA:3**#T
596    E:
600 *PHRASE2
610    SO:11
612    PA:3**#T
620    SO:-1
622    PA:3**#T
630    SO:+1
632    PA:3**#T
640    SO:-1
642    PA:3**#T
650    SO:+1
652    PA:2**#T-1
654    SO:0
656    PA:1
660    SO:11
662    PA:#T
670    SO:-1
672    PA:3**#T
680    SO:+1
682    PA:3**#T
690    SO:+2
692    PA:3**#T
696    E:
700 *PHRASE3
```

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```
700   *PHRASE3
710      SO:18
712      PA:3*#T
720      SO:+2
722      PA:3*#T
730      SO:-2
732      PA:3*#T
740      SO:+2
742      PA:3*#T
750      SO:-2
752      PA:2*#T-1
754      SO:0
756      PA:1
760      SO:18
762      PA:#T
770      SO:+2
772      PA:3*#T
780      SO:-2
782      PA:3*#T
790      SO:+2
792      PA:3*#T
796      E:
800   *SLOWNOTES
810      SO:18
812      PA:18*#T
820      SO:+2
822      PA:6*#T
830      SO:-9
832      PA:18*#T
840      SO:+4
842      PA:6*#T
850      SO:+3
852      PA:18*#T
860      SO:+2
862      PA:6*#T
870      SO:-2
872      PA:24*#T-2
880      SO:0
882      PA:2
890      E:
```

```
 10   C:#TEMPO=5
 12   U:*DANCE
 14   C:#TEMPO=4
 16   U:*DANCE
 18   C:#TEMPO=3
 20   U:*DANCE
 22   C:#TEMPO=2
 24   U:*DANCE
 26   C:#TEMPO=1
 28   U:*DANCE
 30   TURNTO 195
 32   T:NOT\
 40  E:
 50  *DANCE
 60     U:*THEME
 61     R:ERASE "DO THE HUSTLE!"
 62     T:
 64     T:
 66     T:
 68     T:
 70     U:*THEME
 80     U:*SLOWNOTES
 82     T:DO THE HUSTLE!
 90    E:
100  *THEME
110     U:*PHRASE1
130     U:*PHRASE2
140     U:*PHRASE1
150     U:*PHRASE2
160     U:*PHRASE3
170     U:*PHRASE3
180    E:
500  *PHRASE1
508      GO 1;TURN -30
510      SO:15
512      PA:3*#TEMPO
520      SO:-2
522      PA:3*#TEMPO
528      TURN 30;GO 1;TURN 30
530      SO:+2
532      PA:3*#TEMPO
540      SO:-2
542      PA:3*#TEMPO
548      TURN -30;GO 1;TURN -30
550      SO:+2
552      PA:2*#TEMPO-1
554      SO:0
556      PA:1
560      SO:15
562      PA:#TEMPO
570      SO:-2
572      PA:3*#TEMPO
578      TURN 30;GO 1;TURN 30
580      SO:+2
582      PA:3*#TEMPO
590      SO:+3
592      PA:3*#TEMPO
594      TURN -30
596    E:
600  *PHRASE2
```

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```
600 *PHRASE2
608     GO -1
610     SO:11
612     PA:3*#TEMPO
620     SO:-1
622     PA:3*#TEMPO
628     GO -1
630     SO:+1
632     PA:3*#TEMPO
640     SO:-1
642     PA:3*#TEMPO
648     GO -1
650     SO:+1
652     PA:2*#TEMPO-1
654     SO:0
656     PA:1
660     SO:11
662     PA:#TEMPO
670     SO:-1
672     PA:3*#TEMPO
678     GO -1
680     SO:+1
682     PA:3*#TEMPO
690     SO:+2
692     PA:3*#TEMPO
696     E:
700 *PHRASE3
708     TURN -45
710     SO:18
712     PA:3*#TEMPO
720     SO:+2
722     PA:3*#TEMPO
728     TURN 45
730     SO:-2
732     PA:3*#TEMPO
740     SO:+2
742     PA:3*#TEMPO
748     TURN 45
750     SO:-2
752     PA:2*#TEMPO-1
754     SO:0
756     PA:1
760     SO:18
762     PA:#TEMPO
770     SO:+2
772     PA:3*#TEMPO
778     TURN -45
780     SO:-2
782     PA:3*#TEMPO
790     SO:+2
792     PA:3*#TEMPO
796     E:
800 *SLOWNOTES
```

```
800  *SLOWNOTES
808     TURN -90;GO 1;TURN 90
810     SO:18
812     PA:6*#TEMPO
814     TURN -90;GO 1;TURN 90
815     PA:6*#TEMPO
816     TURN -90;GO 1;TURN 90
817     PA:6*#TEMPO
818     TURN -90;GO 1;TURN 45
820     SO:+2
822     PA:6*#TEMPO
828     TURN 135;GO 1;TURN -90
830     SO:-9
832     PA:6*#TEMPO
834     TURN 90;GO 1;TURN -90
835     PA:6*#TEMPO
836     TURN 90;GO 1;TURN -90
837     PA:6*#TEMPO
838     TURN 90;GO 1;TURN -45
840     SO:+4
842     PA:6*#TEMPO
848     TURN -135;GO 1;TURN 90
850     SO:+3
852     PA:6*#TEMPO
854     TURN -90;GO 1;TURN 90
855     PA:6*#TEMPO
856     TURN -90;GO 1;TURN 90
857     PA:6*#TEMPO
858     TURN -90;GO 1;TURN 45
860     SO:+2
862     PA:6*#TEMPO
868     TURN 90
870     SO:-2
872     PA:6*#TEMPO
873     TURN 90
874     PA:6*#TEMPO
875     TURN 90
876     PA:6*#TEMPO
877     TURN 45
878     PA:6*#TEMPO-2
880     SO:0
882     PA:2
890     E:
```

43

```
 80 LETTERS:LARGE
 85 T:
 90 T:    Ur
120 PA:150
150 POS:5,9
160 T:
170 T:
180 PA: 100
185 LETTERS:SMALL
190 CLEAR
200 PEN YELLOW; TURTLE OFF
210 GOTO 50,0
220 DRAWTO 60,0
230 DRAWTO 60,-10
240 DRAWTO 50,-10
250 DRAWTO 50,0
260 GOTO 65,-12
270 DRAWTO 65,-12
280 DRAWTO 65,-16
290 DRAWTO 60,-16
300 DRAWTO 60,-20
310 DRAWTO 50,-20
320 DRAWTO 50,-16
330 DRAWTO 45,-16
340 DRAWTO 45,-12
350 DRAWTO 65,-12
360 GOTO 50,-20
370 DRAWTO 50,-31
380 DRAWTO 60,-31
390 DRAWTO 60,-20
400 GOTO 55,-24
410 DRAWTO 55,-31
420 GOTO 53,-3
430 GOTO 57,-3
440 GOTO 52,-7
450 TURN 90
460 DRAW 6
470 PA: 60
480 T:THIS IS ME!MY FAVORITE COLOR IS YELLOW.I LIKE TO WEAR BLUE JEANS.HIT 'RET
URN' TO CONTINUE.
490 C:#T=6
500 PA:#T
510 U:*UPDOWN
520 A:
530 CLEAR
540 GOTO -20,10
550 DRAWTO -10,10
560 DRAWTO -10,10
570 DRAWTO 0,0
580 DRAWTO 0,-10
590 DRAWTO -10,-20
600 DRAWTO -20,-20
610 DRAWTO -30,-10
620 DRAWTO -30,0
630 DRAWTO -20,10
640 GOTO -30,0
650 DRAWTO -20,5
660 DRAWTO -10,5
670 DRAWTO 0,0
680 GOTO -30,-10
690 DRAWTO -20,-15
700 DRAWTO -10,-15
```

44

```
 700 DRAWTO -10,-15
 710 DRAWTO 0,-10
 720 PEN YELLOW
 730 GOTO -60,47
 740 DRAWTO -60,20
 750 DRAWTO 50,20
 760 DRAWTO 50,47
 770 GOTO -60,47
 780 C:#Q=1
 790 C:#I=1
 860 T:I LIKE BASEBALL.MY FAVORITE TEAM IS THE NEW YORK YANKEES.HIT 'RETURN TO C
ONTINUE.
 870 C:#T=18
 880 SO:25
 890 PA:#T
 900 SO:29
 910 PA:#T
 920 SO:27
 930 PA:#T
 940 SO:24
 950 PA:#T
 960 SO:29
 970 PA:#T
 980 SO:27
 990 PA:#T
1000 SO:24
1010 PA:#T
1020 SO:25
1030 PA:#T
1040 SO:29
1050 PA:#T
1060 SO:
1070 PA:#T
1080 SO:24
1090 PA:#T
1100 SO:22
1110 PA:#T
1120 SO:25
1130 PA:#T
1140 SO:26
1150 PA:#T
1160 SO:25
1170 PA:#T
1180 SO:24
1190 PA:#T
1200 SO:22
1210 PA:#T
1230 SO:0
1240 A:
1250 CLEAR
1260 PEN YELLOW
1270 GOTO 0,0
1280 DRAWTO 0,20
1290 DRAWTO -20,20
1300 DRAWTO -20,0
```

```
1300 DRAWTO -20,0
1310 DRAWTO 0,0
1320 DRAWTO 5,5
1330 DRAWTO 5,25
1340 DRAWTO -15,25
1350 DRAWTO -15,5
1360 DRAWTO 5,5
1370 GOTO 0,20
1380 DRAWTO 5,25
1390 GOTO -20,20
1400 DRAWTO -15,25
1410 GOTO -20,0
1420 DRAWTO -15,5
1430 ,      PA:#T
1440 T:I LIKE MATH & DRAWING GEOMECTRICAL FIGURES.HIT RETURN TO CONTINUE.
1450 C:#T=60
1460 SO:22
1470 PA:#T
1480 SO:24
1490 PA:#T
1500 SO:25
1510 PA:#T
1520 SO:27
1530 SO:0
1540 A:
1550 CLEAR
1560 PEN BLUE
1570 GOTO 10,0
1580 DRAWTO 30,0
1590 GOTO 0,10
1600 DRAWTO -50,10
1610 DRAWTO -60,5
1620 DRAWTO -60,-5
1630 DRAWTO -50,-8
1640 GOTO -30,-6
1650 DRAWTO 10,0
1660 PEN YELLOW
1670 GOTO 0,10
1680 DRAWTO 0,0
1690 DRAWTO 10,0
1700 DRAWTOO,10
1710 GOTO -60,5
1720 DRAWTO -70,5
1730 DRAWTO -65,2
1740 DRAWTO -79,0
1750 DRAWTO -65,-5
1760 DRAWTO -70,-4
1770 PEN RED
1780 GOTO -20,10
1790 DRAWTO -30,20
1800 DRAWTO -35,20
1810 DRAWTO -32,10
1820 GOTO -50,10
1830 DRAWTO -56,16
1840 DRAWTO -62,16
1850 DRAWTO -60,8
1860 GOTO -22,4
1870 DRAWTO -40,4
1880 DRAWTO -77,-30
1890 DRAWTO -52,-30
1900 DRAWTO -22,4
```

46

```
1900 DRAWTO -22,4
1910 T:I ALSO LIKE BUILDING MODEL ROCKETS.HIT 'RETURN' TO GO ON.
1920 C:#T=60
1930 SO:26
1940 PA:#T
1950 SO:24
1960 PA:#T
1970 SO:23
1980 PA:#T
1990 SO:22
2000 SO:0
2010 A:
2080 LETTERS:MEDIUM
2090 POS:5,6
2100 T:Te  d
2110 PA: 100
2120 C:#T=8
2130 PA:#T
2140 U:*UPDOWN
2150 PA:#T
2160 U:*PONY
2170 PA:#T
2180 U:*DOWN
2185 PA:100
2190 E:
2200 *DOWN  SO:20
2210 ,      PA:#T
2220 ,      SO:19
2230 ,      PA:#T
2240 ,      SO:18
2250 ,      PA:#T
2260 ,      SO:17
2270 ,      PA:#T
2280 ,      SO:16
2290 ,      PA:#T
2300 ,      SO:15
2310 ,      PA:#T
2320 ,      SO:14
2330 ,      PA:#T
2340 ,      SO:13
2350 ,      PA:#T
2360 ,      SO:12
2370 ,      PA:#T
2380 ,      SO:11
2390 ,      PA:#T
2400 ,      SO:10
2410 ,      PA:#T
2420 ,      SO:9
2430 ,      PA:#T
2440 ,      SO:8
2450 ,      PA:#T
2460 ,      SO:7
2470 ,      PA:#T
2480 ,      SO:6
2490 ,      PA:#T
2500 ,      SO:5
```

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```
2500 ,      SO:5
2510 ,      PA:#T
2520 ,      SO:4
2530 ,      PA:#T
2540 ,      SO:3
2550 ,      PA:#T
2560 ,      SO:2
2570 ,      PA:#T
2580 ,      SO:1
2590 ,      PA:#T
2600 ,      SO:0
2610 ,      E:
2620 *UPDOWN SO:30
2630 ,      PA:#T
2640 ,      SO:1
2650 ,      PA:#T
2660 ,      SO:29
2670 ,      PA:#T
2680 ,      SO:2
2690 ,      PA:#T
2700 ,      SO:28
2710 ,      PA:#T
2720 ,      SO:3
2730 ,      PA:#T
2740 ,      SO:27
2750 ,      PA:#T
2760 ,      SO:4
2770 ,      PA:#T
2780 ,      SO:26
2790 ,      PA:#T
2800 ,      SO:5
2810 ,      PA:#T
2820 ,      SO:25
2830 ,      PA:#T
2840 ,      SO:6
2850 ,      PA:#T
2860 ,      SO:24
2870 ,      PA:#T
2880 ,      SO:7
2890 ,      PA:#T
2900 ,      SO:23
2910 ,      PA:#T
2920 ,      SO:8
2930 ,      PA:#T
2940 ,      SO:22
2950 ,      PA:#T
2960 ,      SO:9
2970 ,      PA:#T
2980 ,      SO:21
2990 ,      PA:#T
3000 ,      SO:10
3010 ,      PA:#T
3020 ,      SO:20
3030 ,      PA:#T
3040 ,      SO:11
3050 ,      PA:#T
3060 ,      SO:19
3070 ,      PA:#T
3080 ,      SO:12
3090 ,      PA:#T
3100 ,      SO:18
```

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```
3100 ,     SO:18
3110 ,     PA:#T
3120 ,     SO:13
3130 ,     PA:#T
3140 ,     SO:17
3150 ,     PA:#T
3160 ,     SO:14
3170 ,     PA:#T
3180 ,     SO:16
3190 ,     PA:#T
3200 ,     SO:15
3210 ,     PA:#T
3220 ,     SO:0
3230 ,     E:
4030 *PONY SO:13
4040 ,     PA:#T
4050 ,     SO:13
4060 ,     PA:#T
4070 ,     SO:15
4080 ,     PA:#T
4090 ,     SO:17
4100 ,     PA:#T
4110 ,     SO:18
4120 ,     PA:#T
4130 ,     SO:17
4140 ,     PA:#T
4150 ,     SO:15
4160 ,     PA:#T
4170 ,     SO:13
4180 ,     PA:#T
4190 ,     SO:0
4200 ,     E:
```

```
 10 GOTO -75,20
 20 TURNTO 90
 30 PEN RED
 40 U:*L
 50 GO 20
 60 PEN BLUE
 70 U:*E
 80 GO 20
 90 PEN YELLOW
100 U:*S
110 GO 20
120 PEN RED
130 U:*L
140 GO 20
150 PEN BLUE
160 U:*I
170 GO 10
180 PEN YELLOW
190 U:*E
192 GO 40
199 E:
200 *L
210   DRAW 5; TURN 90; DRAW 25; TURN -90; DRAW 10; TURN 90; DRAW 5; TURN 90; DRA
W 15; TURN 90; FILL 30
220   TURN 90
230 E:
300 *E
310   DRAW 15; TURN 90; DRAW 5; TURN 90; DRAW 10; TURN -90; DRAW 5; TURN -90; DR
AW 5; TURN 90; DRAW 5
320   TURN 90; DRAW 5; TURN -90; DRAW 10; TURN -90; DRAW 10; TURN 90; DRAW 5; TU
RN 90; DRAW 15; TURN 90
330   FILL 30; TURN 90
340 E:
400 *S
410   DRAW 15; TURN 90; DRAW 5; TURN 90; DRAW 10; TURN -90; DRAW 5; TURN -90; DR
AW 10; TURN 90; DRAW 20
420   TURN 90; DRAW 15; TURN 90; FILL 5; TURN 90; DRAW 10; TURN -90; FILL 10;TUR
N -90; DRAW 10; TURN 90
430   FILL 15; TURN 90
440 E:
500 *I
510   DRAW 5; TURN 90; DRAW 5; TURN 90;DRAW 5; GO -5; TURN -90
520   GO 5; DRAW 20; TURN 90; DRAW 5; TURN 90; FILL 20; GO 5; FILL 5; TURN 90
530 E:
```

50

```
  10 *MASTER
 150 PEN YELLOW; TURTLE OFF
 160 GOTO 0,30
 170 DRAWTO -30,0
 180 DRAWTO 0,-30
 210 GOTO 0,50
 220 FILLTO 0,30
 240 FILLTO 30,0
 280 FILLTO 0,-30
 290 FILLTO 0,-35
 300 GOTO -79,47; DRAWTO 79,47
 310 PA:120
 311 T:▰▰▰▰▰
 312 SO:4,130
 313 PA:80
 314 SO:20
 316 SO:0
 320 PEN ERASE
 330 GOTO 0,0
 340 DRAWTO 0,-31
 350 GOTO 0,0
 360 DRAWTO 79,0
 370 GOTO 0,0
 380 DRAWTO 0,47
 390 GOTO 0,0
 400 DRAWTO -79,0
 405 PA:120
 410 T:▰▰▰▰▰▰▰
 420 SO:2,8,10,13
 430 PA:80
 440 SO:0
 450 PA:120
 460 PEN BLUE
 470 GOTO 0,3
 480 DRAWTO -3,0
 490 DRAWTO 0,-3
 500 DRAWTO 3,0
 510 DRAWTO 0,3
 520 GOTO 3,0
 530 DRAWTO 4,0
 540 GOTO -3,0
 550 DRAWTO -4,0
 560 GOTO 4,5
 570 DRAWTO 4,-5
 580 GOTO -4,5
 590 DRAWTO -4,-5
 600 PA:120
 610 T:▰▰▰▰▰
 615 PA:100
 620 T:MADE BY:ROBERT LEITNER
 625 PA:100
 700 PEN YELLOW
 710 HOME
 720 C:#SIZE=0
 750 *EXPLODE
 755     SO:1,2
 760     5 ( DRAW #SIZE; TURN 172; DRAW #SIZE; TURN -100 )
 765     SO:8,7
 770     TURN 31
 780     C:#SIZE=#SIZE+1
 790     J:*EXPLODE
```

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```
 10 R: RUN THE PROGRAM.   THEN TRAVERSE THE MAZE
 90 TURTLE OFF
100 GR:CLEAR;PEN RED
110 GR:GOTO -55,25;TURNTO 0
120 GR:DRAW 10;TURN 90;DRAW 15;TURN 90;DRAW 25;TURN 90;DRAW 30;TURN 90;DRAW 35;
URN 90;DRAW 145;TURN 90
130 GR:DRAW 75;TURN 90;DRAW 85;TURN 90;DRAW 18;TURN -90;DRAW 40;TURN -90;DRAW 8
;TURN -90;DRAW 25;TURN 180
140 GR:GOTO -10,-30
150 GR:DRAW 60;TURN 90;DRAW 25;TURN 90;DRAW 45;TURN -90;DRAW 40;TURN 90;DRAW 75
;TURN 90;DRAW 55;TURN 90
160 GR:DRAW 45;TURN 90;DRAW 8;TURN 90;DRAW 25;TURN -90;DRAW 32;TURN -90;DRAW 40
;TURN -90;DRAW 25;TURN -90
170 GR:DRAW 20;TURN -90;DRAW 15
180 GR:PEN YELLOW;GOTO 0,0
190 WALL RED;EDGE HALT;TURTLE ON
200 T:   THE TURTLE IS IN THE MIDDLE FACING UP.   PRESS RETURN
210 A:
220 T:GET THE TURTLE OUT OF THE MAZE.\
```

```
 10 R: RUN THE PROGRAM.   THEN GUIDE THE TURTLE THROUGH THE MAZE.
 90 TURTLE OFF
100 GR:CLEAR;PEN BLUE
200 GR:GOTO -79,-5;DRAWTO -79,-32;GOTO 79,-32;DRAWTO 79,47;DRAWTO -60,47
210 GR:GOTO -50,0;DRAWTO -65,30;DRAWTO -60,47;DRAWTO -79,47;DRAWTO-79,20;DRAWTO
-65,0;DRAWTO-60,-16
220 GR:DRAWTO -28,-15;DRAWTO -48,31;GOTO 65,-17;DRAWTO 62,-7;DRAWTO 40,-32;DRAW
TO 3,-32;DRAWTO -30,24
230 GR:DRAWTO 10,32;DRAWTO -10,20;DRAWTO 10,-10;DRAWTO 30,-16;DRAWTO 47,0;DRAWT
O 43,13;DRAWTO 35,16
240 GR:GOTO 43,13;DRAWTO 28,-1;DRAWTO 11,14;DRAWTO32,31;DRAWTO 57,28;DRAWTO 63,
8
250 GOTO -79,-32;DRAWTO 79,-32
300 GR:PEN YELLOW;GOTO 25,11;TURNTO 0
310 WALL BLUE; EDGE HALT; TURTLE ON
320 T:
350 T:GUIDE THE TURTLE OUT OF THE MAZE.\
```

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```
 10 R:RUN THE PROGRAM. THEN GUIDE THE  TURTLE OUT OF THE MAZE.
 90 TURTLE OFF
100 GR:CLEAR;PEN RED
110 GR:GOTO 56,5;TURNTO 90
120 GR:DRAW 14;TURN -90;DRAW 30;TURN -90;DRAW 14;TURN -90;DRAW 10;TURN -90;DRAW
7;TURN -90;DRAW 5
130 GR:GOTO 63,5;DRAW 15;GOTO 56,10;DRAW 10;TURN -90;DRAW 7;TURN 90;DRAW 10;TUR
N -90;DRAW 28
140 GR:GOTO 56,15;DRAW 7;GOTO 56,35;DRAW 105;TURN -90;DRAW 5;GOTO 14,35;DRAW 5;
GOTO -7,35;DRAW 10
150 GR:GOTO 42,30;DRAW 20;TURN 90;DRAW 7;TURN -90;DRAW 5;TURN -90;DRAW 7;TURN 9
0;DRAW 5;TURN -90;DRAW 7
160 GR:GOTO 49,-20;DRAW 21;  GOTO 56,-5;DRAW 7;TURN 90;DRAW 10;TURN 90;DRAW 21;
TURN -90;DRAW 10
170 GR:GOTO 49,10;DRAW 10;TURN -90;DRAW 21;TURN 90;DRAW 25;TURN 90;DRAW 140;TUR
N 90;DRAW 30;TURN 90
180 GR:DRAW 7;TURN 90;DRAW 10;TURN -90;DRAW 14;TURN -90;DRAW 15;TURN 90;DRAW 7;
TURN -90;DRAW 5;TURN 90
190 GR:DRAW 14;TURN 90;DRAW 10;TURN -90;DRAW 14;TURN 90;DRAW 5;TURN -90;DRAW 14
;TURN -90;DRAW 15;TURN -90
200 GR:DRAW 21;TURN 90;DRAW 10;TURN -90;DRAW 14;TURN -90;DRAW 5;TURN 90;DRAW 28
;TURN 90;DRAW 5
210 GR:GOTO -56,0;DRAW 10;TURN -90;DRAW 14;TURN 90;DRAW 25;TURN 90;DRAW 35;TURN
 90;DRAW 5;TURN -90
220 GR:DRAW 21;TURN 90;DRAW 10;TURN -90;DRAW 14;TURN -90;DRAW 10;TURN 90;DRAW 7
;TURN 90;DRAW 5;TURN -90
230 GR:DRAW 21;TURN 90;3(DRAW 5;TURN 90;DRAW 7;TURN -90);DRAW 15;TURN -90;DRAW
7;TURN -90;DRAW 10
240 GR:3(TURN 90;DRAW 7;TURN -90;DRAW 5);DRAW 5;GOTO -28,15;DRAW 5;GOTO -7,5;DR
AW 5;TURN -90;DRAW 21
250 GR:GOTO 14,20;DRAW 14;GOTO 7,15;DRAW 7;GOTO -28,5;DRAW 14;GOTO -49,15;DRAW
14;TURN 90;DRAW 5
260 GR:GOTO 21,-5;DRAW 5;TURN 90;DRAW 14;TURN 90;DRAW 5;GOTO 28,10;DRAW 10;GOTO
-42,30;DRAW 5;TURN 90
270 GR:DRAW 14;TURN 90;DRAW 5;TURN -90;DRAW 14;GOTO -35,10;DRAW 7;GOTO 49,-5;DR
AW 21;TURN -90;DRAW 10
280 GR:GOTO -28,0;DRAW 10;TURN 90;DRAW 35;TURN -90;DRAW 10;TURN -90;DRAW 63;TUR
N -90;DRAW 5;TURN 90;DRAW 14
290 GR:TURN 90;DRAW 10;TURN 180;GOTO -42,-10;DRAW 10;TURN 90;DRAW 7;TURN 90;DRA
W 5;GOTO -21,0;DRAW 15
300 GR:TURN 90;DRAW 35;GOTO 7,-20;DRAW 7;GOTO 56,-10;DRAW 21;TURN -90;DRAW 10;T
URN 90;DRAW 14;TURN 90
310 GR:DRAW 10;TURN -90;DRAW 28;TURN -90;DRAW 5;TURN 90;DRAW 14;TURN 90;DRAW 10
;TURN 90;DRAW 28
320 GR:GOTO -14,-5;TURN 90;DRAW 5
350 GR:PEN YELLOW;GOTO 75,2;TURNTO -90
360 WALL RED;EDGE HALT;TURTLE ON
400 T:  THE TURTLE IS ON THE RIGHT.
410 T:
420 T:          PRESS RETURN.
430 A:
440 T:GET THE TURTLE THROUGH THE MAZE.\
```

53

```
10 R: RUN THE PROGRAM. THEN GUIDE THE TURTLE THROUGH THE MAZE.
90 TURTLE OFF
100 GR:CLEAR;PEN RED
110 GR:GOTO 10,10;TURNTO 200;DRAW 20;TURN 90;DRAW 20;TURN 70;DRAW 20;TURN 60;DR
AW 18;TURN 50;DRAW 30
120 GR:TURN 90;DRAW 18;TURN-135;DRAW 22;TURN -100;DRAW 20
130 GR:TURN-35;DRAW 35;TURN -50;DRAW 28
140 GR:TURN -35;GO 10;TURN 125;DRAW 15;TURN  90;DRAW 12;TURN -99;DRAW 10
150 GR:TURN -101;DRAW 18;TURN -70;DRAW 40
160 GR:TURN -40;DRAW 30;TURN- 40;DRAW 35
170 GR:TURN 170;DRAW 40;TURN 45;DRAW 30
180 GR:TURN 45;DRAW 40;TURN -100;DRAW 25
190 GR:TURN 130;DRAW 40;TURN 90;DRAW12;TURN 105;DRAW 25;TURN -160;DRAW 35
200 GR:TURN 53;DRAW 12;TURN 60;DRAW 20
210 GR:TURN 180;DRAW 20;TURN 122;DRAW 100
220 GR:TURN 90;DRAW 77;TURN 90;DRAW 145;TURN 90;DRAW 40
230 GR:TURN 180;DRAW 25;TURN -130;DRAW 28;TURN 105;DRAW 25;TURN 120;DRAW 20;TUR
N 130;DRAW 10
240 GR:GOTO 35,-6;TURN 23;DRAW 22
250 GR:TURN -90;DRAW 30;TURN -50;DRAW 20
260 GR:TURN 155;DRAW 33;TURN  95;DRAW 20
270 GR:GOTO 20,-31;TURN -120;DRAW 27
280 GR:TURN 45;GO 15;TURN -110;DRAW 22
300 GR:PEN YELLOW;GOTO -3,3;TURNTO 0
310 WALL RED; EDGE HALT; TURTLE ON
400 T:THE TURTLE IS IN THE MIDDLE FACING UP.
410 T:
420 T:PRESS RETURN.\
430 A:
440 T:GET THE TURTLE OUT OF THE MAZE.\
```

```
 20 U:*DESIGN
 30 U:*DESIGN
 40 U:*DESIGN
 50 U:*DESIGN
 60 GOTO 30,20
 65 U:*DESIGN
 70 GOTO 40,10
 80 U:*DESIGN
 90 GOTO 50,0
100 U:*DESIGN
110 GOTO -60,0
112 NORTH
114 U:*DESIGN
120 GOTO -50, 2
122 NORTH
124 U:*DESIGN
130 GOTO -40, 5
132 NORTH
134 U:*DESIGN
140 GOTO -30,10
142 NORTH
144 U:*DESIGN
150 GOTO -20,18
152 NORTH
154 U:*DESIGN
160 GOTO -10,31
162 NORTH
164 U:*DESIGN
190 E:
200 *DESIGN
210    DRAW 10
220    TURN -20
230    DRAW 3
240    TURN -20
250    DRAW 3
260    TURN -120
270    DRAW 3
280    TURN -20
290    DRAW 3
300    TURN -20
310    DRAW 3
320    TURN -50
330    DRAW 3
340    TURN -20
350    DRAW 3
390    E:
```

55

```
  5 *ROCKET
  8 PEN YELLOW; TURTLE OFF
 10 GOTO 0,30
 20 DRAWTO 10,20
 30 DRAWTO 10,-20
 40 DRAWTO -10,-20
 50 DRAWTO -10,20
 60 DRAWTO 0,30
 70 GOTO 10,-10
 80 DRAWTO 20,-20
 90 DRAWTO 10,-20
100 GOTO -10,-10
110 DRAWTO -20,-20
120 DRAWTO -10,-20
130 DRAWTO -10,-25
140 DRAWTO 0,-25
150 DRAWTO 0,-20
160 GOTO 10,-25
170 DRAWTO 0,-25
180 GOTO 10,-20
190 DRAWTO 10,-25
200 GOTO -10,0
210 DRAWTO -20,0
220 DRAWTO -20,5
230 GOTO 10,0
240 DRAWTO 20,0
250 DRAWTO 20,5
260 GOTO 20,10
270 PEN BLUE
280 DRAWTO 20,30
290 PA:10
300 PEN ERASE
310 DRAWTO 20,10
320 GOTO -20,10
330 PEN BLUE
340 DRAWTO -20,30
350 PA:10
360 PEN ERASE
365 DRAWTO -20,10
370 PEN YELLOW
380 GOTO -30,-10
390 DRAWTO -20,-20
400 GOTO 20,-20
410 DRAWTO 30,-10
420 U:*SHIPLEFT
430 U:*SHIPRIGHT
565 C:#T=12
570 U:*CHEESE
580 U:*TUNA
590 U:*PONY
600 U:*RONI
605 PEN BLUE
610 GOTO 30,-10
620 GOTO 30,-10
630 DRAWTO 70,30
640 PA:10
650 PEN ERASE
660 DRAWTO 30,-10
665 PEN BLUE
670 GOTO -30,-10
680 DRAWTO -70,30
690 PA:10
700 PEN ERASE
```

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```
 700 PEN ERASE
 710 DRAWTO -30,-10
 715 PEN RED
 720 GOTO 55,35
 730 U:*STAR
 740 GOTO -50,35
 750 U:*STAR
 760 PEN ERASE
 770 U:*SHIPLEFT
 780 U:*SHIPRIGHT
 910 GOTO 0,0
1000 E:
1990 *SHIPLEFT
2000 GOTO -70,30
2010 DRAWTO -70,47
2020 DRAWTO -60,40
2030 DRAWTO -40,40
2040 DRAWTO -30,30
2050 DRAWTO -70,30
2052 E:
2055 *SHIPRIGHT
2060 GOTO 70,30
2070 DRAWTO 70,40
2080 DRAWTO 40,40
2090 DRAWTO 30,30
2100 DRAWTO 70,30
2110 DRAWTO 70,47
2120 GOTO 70,47
2130 DRAWTO 60,40
2140 E:
5382 *CHEESE SO:13
5384        PA:#T
5386        SO:13
5388        PA:#T
5390        SO:15
5392        PA:#T
5394        SO:17
5398        SO:13
5400        PA:#T
5402        SO:17
5404        PA:#T
5406        SO:15
5408        PA:#T
5410        SO:15
5412        PA:#T
5414        SO:0
5416        SO:0
5418        E:
5420 *TUNA SO:13
5422        PA:#T
5424        SO:13
5426        PA:#T
5428        SO:15
5430        PA:#T
5432        SO:17
5434        PA:#T
5436        SO:13
5438        PA:#T
5440        SO:13
```

5-7

```
5440       SO:13
5442       PA:#T
5444       SO:12
5446       PA:#T
5448       SO:12
5450       PA:#T
5452       SO:0
5454       E:
5456 *PONY SO:13
5458       PA:#T
5460       SO:13
5462       PA:#T
5464       SO:15
5466       PA:#T
5468       SO:17
5470       PA:#T
5472       SO:18
5474       PA:#T
5476       SO:17
5478       PA:#T
5480       SO:15
5482       PA:#T
5484       SO:13
5486       PA:#T
5488       SO:0
5490       E:
5492 *RONI SO:12
5494       PA:#T
5496       SO:8
5498       PA:#T
5500       SO:10
5502       PA:#T
5504       SO:12
5506       PA:#T
5508       SO:13
5510       PA:#T
5512       SO:0
5514       PA:#T
5516       SO:13
5518       PA:#T
5520       SO:13
5522       PA:#T
5524       SO:0
5526       E:
6000 E:
6010 *STAR
6020 DRAW 8
6030 DRAW -16
6040 DRAW 8
6050 TURN 45
6060 DRAW 8
6070 DRAW -16
6080 DRAW 8
6090 TURN 45
7000 DRAW 8
7010 DRAW -16
7020 DRAW 8
7030 TURN 45
7040 DRAW 8
7050 DRAW -16
7060 E:
```

58

```
 50 PEN YELLOW
 52 C:#T=40
 54 U:*SHOW
 60 PEN RED
 62 C:#T=15
 64 U:*SHOW
 70 PEN BLUE
 72 C:#T=5
 74 U:*SHOW
 80 GOTO 0,100
 82 PA:15
 90 SO:0
100 E:
110 *SHOW
112 GOTO 0,0
120 U:*DESIGN
122 SO:15
124 PA:#T
130 GOTO 20,30
140 U:*DESIGN
142 SO:17
144 PA:#T
150 GOTO -15,-10
160 U:*DESIGN
162 SO:13
164 PA:#T
170 GOTO 40,-20
180 U:*DESIGN
182 SO:5
184 PA:#T
190 GOTO -50,10
192 U:*DESIGN
194 SO:8
196 PA:#T
198 E:
200 *DESIGN
210    DRAW 10
220    TURN -20
230    DRAW 3
240    TURN -20
250    DRAW 3
260    TURN -120
270    DRAW 3
280    TURN -20
290    DRAW 3
300    TURN -20
310    DRAW 3
320    TURN -50
330    DRAW 3
340    TURN -20
350    DRAW 3
360    TURN -90
390    E:
```

59

```
  20 C:#T=12
  30 U:*CHEESE
  40 U:*CHEESE
  50 U:*CHEESE
  60 U:*RONI
 100 C:#T=12
 110 U:*CHEESE
 120 C:#T=5
 130 U:*UP
 140 U:*DOWN
 150 C:#T=12
 160 U:*RONI
 200 C:#T=12
 210 U:*CHEESE
 220 C:#T=2
 230 U:*UP
 232 PA:20
 240 U:*DOWN
 242 PA:20
 250 C:#T=12
 260 U:*CHEESE
 270 U:*RONI
 300 U:*CHEESE
 310 U:*TUNA
 320 U:*PONY
 330 U:*RONI
 999 E:
1000 *UP      SO:5
1010 ,        PA:#T
1020 ,        SO:6
1030 ,        PA:#T
1040 ,        SO:7
1050 ,        PA:#T
1060 ,        SO:8
1070 ,        PA:#T
1080 ,        SO:9
1090 ,        PA:#T
1100 ,        SO:10
1110 ,        PA:#T
1120 ,        SO:11
1130 ,        PA:#T
1140 ,        SO:12
1150 ,        PA:#T
1160 ,        SO:13
1170 ,        PA:#T
1180 ,        SO:14
1190 ,        PA:#T
1200 ,        SO:15
1210 ,        PA:#T
1220 ,        SO:16
1230 ,        PA:#T
1240 ,        SO:17
1250 ,        PA:#T
1260 ,        SO:18
1270 ,        PA:#T
1280 ,        SO:19
1290 ,        PA:#T
1300 ,        SO:20
```

```
1300 ,      SO:20
1310 ,      PA:#T
1320 ,      SO:21
1330 ,      PA:#T
1340 ,      SO:22
1350 ,      PA:#T
1360 ,      SO:23
1370 ,      PA:#T
1380 ,      SO:24
1390 ,      PA:#T
1400 ,      SO:25
1410 ,      PA:#T
1420 ,      SO:0
1430 ,      E:
1500 *DOWN  SO:20
1510 ,      PA:#T
1520 ,      SO:19
1530 ,      PA:#T
1540 ,      SO:18
1550 ,      PA:#T
1560 ,      SO:17
1570 ,      PA:#T
1580 ,      SO:16
1590 ,      PA:#T
1600 ,      SO:15
1610 ,      PA:#T
1620 ,      SO:14
1630 ,      PA:#T
1640 ,      SO:13
1650 ,      PA:#T
1660 ,      SO:12
1670 ,      PA:#T
1680 ,      SO:11
1690 ,      PA:#T
1700 ,      SO:10
1710 ,      PA:#T
1720 ,      SO:9
1730 ,      PA:#T
1740 ,      SO:8
1750 ,      PA:#T
1760 ,      SO:7
1770 ,      PA:#T
1780 ,      SO:6
1790 ,      PA:#T
1800 ,      SO:5
1810 ,      PA:#T
1820 ,      SO:4
1830 ,      PA:#T
1840 ,      SO:3
1850 ,      PA:#T
1860 ,      SO:2
1870 ,      PA:#T
1880 ,      SO:1
1890 ,      PA:#T
1900 ,      SO:0
1910 ,      E:
2000 *UPDOWN SO:30
```

61

```
2000 *UPDOWN SO:30
2010 ,      PA:#T
2020 ,      SO:1
2030 ,      PA:#T
2040 ,      SO:29
2050 ,      PA:#T
2060 ,      SO:2
2070 ,      PA:#T
2080 ,      SO:28
2090 ,      PA:#T
2100 ,      SO:3
2110 ,      PA:#T
2120 ,      SO:27
2130 ,      PA:#T
2140 ,      SO:4
2150 ,      PA:#T
2160 ,      SO:26
2170 ,      PA:#T
2180 ,      SO:5
2190 ,      PA:#T
2200 ,      SO:25
2210 ,      PA:#T
2220 ,      SO:6
2230 ,      PA:#T
2240 ,      SO:24
2250 ,      PA:#T
2260 ,      SO:7
2270 ,      PA:#T
2280 ,      SO:23
2290 ,      PA:#T
2300 ,      SO:8
2310 ,      PA:#T
2320 ,      SO:22
2330 ,      PA:#T
2340 ,      SO:9
2350 ,      PA:#T
2360 ,      SO:21
2370 ,      PA:#T
2380 ,      SO:10
2390 ,      PA:#T
2400 ,      SO:20
2410 ,      PA:#T
2420 ,      SO:11
2430 ,      PA:#T
2440 ,      SO:19
2450 ,      PA:#T
2460 ,      SO:12
2470 ,      PA:#T
2480 ,      SO:18
2490 ,      PA:#T
2500 ,      SO:13
2510 ,      PA:#T
2520 ,      SO:17
2530 ,      PA:#T
2540 ,      SO:14
2550 ,      PA:#T
2560 ,      SO:16
2570 ,      PA:#T
2580 ,      SO:15
2590 ,      PA:#T
2599 ,      SO:0
2600 ,      E:
3000 *TRILL SO:25
```

62

```
3000 *TRILL SO:25
3010 ,       PA:#T
3020 ,       SO:24
3030 ,       PA:#T
3040 ,       SO:25
3050 ,       PA:#T
3060 ,       SO:24
3070 ,       PA:#T
3080 ,       SO:25
3090 ,       PA:#T
3100 ,       SO:24
3110 ,       PA:#T
3120 ,       SO:25
3130 ,       PA:#T
3140 ,       SO:24
3150 ,       PA:#T
3160 ,       SO:25
3170 ,       PA:#T
3180 ,       SO:24
3190 ,       PA:#T
3200 ,       SO:25
3210 ,       PA:#T
3220 ,       SO:24
3230 ,       PA:#T
3240 ,       SO:25
3250 ,       PA:#T
3260 ,       SO:24
3270 ,       PA:#T
3280 ,       SO:25
3290 ,       PA:#T
3300 ,       SO:24
3310 ,       PA:#T
3320 ,       SO:25
3330 ,       PA:#T
3340 ,       SO:24
3350 ,       PA:#T
3360 ,       SO:25
3370 ,       PA:#T
3380 ,       SO:24
3390 ,       PA:#T
3400 ,       SO:0
3410 ,       E:
5000 *CHEESE SO:13
5010 ,       PA:#T
5020 ,       SO:13
5030 ,       PA:#T
5040 ,       SO:15
5050 ,       PA:#T
5060 ,       SO:17
5070 ,       PA:#T
5080 ,       SO:13
5090 ,       PA:#T
5100 ,       SO:17
5110 ,       PA:#T
5120 ,       SO:15
5130 ,       PA:#T
5140 ,       SO:15
5150 ,       PA:#T
5155 ,       SO:0
5160 ,       SO:0
5170 ,       E:
5200 *TUNA SO:13
```

63

```
5200 *TUNA SO:13
5210 ,     PA:#T
5220 ,     SO:13
5230 ,     PA:#T
5240 ,     SO:15
5250 ,     PA:#T
5260 ,     SO:17
5270 ,     PA:#T
5280 ,     SO:13
5290 ,     PA:#T
5300 ,     SO:13
5310 ,     PA:#T
5320 ,     SO:12
5330 ,     PA:#T
5340 ,     SO:12
5350 ,     PA:#T
5355 ,     SO:0
5360 ,     E:
5400 *PONY SO:13
5410 ,     PA:#T
5420 ,     SO:13
5430 ,     PA:#T
5440 ,     SO:15
5450 ,     PA:#T
5460 ,     SO:17
5470 ,     PA:#T
5480 ,     SO:18
5490 ,     PA:#T
5500 ,     SO:17
5510 ,     PA:#T
5520 ,     SO:15
5530 ,     PA:#T
5540 ,     SO:13
5550 ,     PA:#T
5560 ,     SO:0
5570 ,     E:
5600 *RONI SO:12
5610 ,     PA:#T
5620 ,     SO:8
5630 ,     PA:#T
5640 ,     SO:10
5650 ,     PA:#T
5660 ,     SO:12
5670 ,     PA:#T
5680 ,     SO:13
5690 ,     PA:#T
5700 ,     SO:0
5710 ,     PA:#T
5720 ,     SO:13
5730 ,     PA:#T
5740 ,     SO:13
5750 ,     PA:#T
5760 ,     SO:0
5770 ,     E:
```

64

```
999  E:
1000 *UP    SO:5
1010 ,      PA:#T
1020 ,      SO:6
1030 ,      PA:#T
1040 ,      SO:7
1050 ,      PA:#T
1060 ,      SO:8
1070 ,      PA:#T
1080 ,      SO:9
1090 ,      PA:#T
1100 ,      SO:10
1110 ,      PA:#T
1120 ,      SO:11
1130 ,      PA:#T
1140 ,      SO:12
1150 ,      PA:#T
1160 ,      SO:13
1170 ,      PA:#T
1180 ,      SO:14
1190 ,      PA:#T
1200 ,      SO:15
1210 ,      PA:#T
1220 ,      SO:16
1230 ,      PA:#T
1240 ,      SO:17
1250 ,      PA:#T
1260 ,      SO:18
1270 ,      PA:#T
1280 ,      SO:19
1290 ,      PA:#T
1300 ,      SO:20
1310 ,      PA:#T
1320 ,      SO:21
1330 ,      PA:#T
1340 ,      SO:22
1350 ,      PA:#T
1360 ,      SO:23
1370 ,      PA:#T
1380 ,      SO:24
1390 ,      PA:#T
1400 ,      SO:25
1410 ,      PA:#T
1420 ,      SO:0
1430 ,      E:
1500 *DOWN  SO:20
1510 ,      PA:#T
1520 ,      SO:19
1530 ,      PA:#T
1540 ,      SO:18
1550 ,      PA:#T
1560 ,      SO:17
1570 ,      PA:#T
1580 ,      SO:16
1590 ,      PA:#T
1600 ,      SO:15
```

65

```
1600 ,      SO:15
1610 ,      PA:#T
1620 ,      SO:14
1630 ,      PA:#T
1640 ,      SO:13
1650 ,      PA:#T
1660 ,      SO:12
1670 ,      PA:#T
1680 ,      SO:11
1690 ,      PA:#T
1700 ,      SO:10
1710 ,      PA:#T
1720 ,      SO:9
1730 ,      PA:#T
1740 ,      SO:8
1750 ,      PA:#T
1760 ,      SO:7
1770 ,      PA:#T
1780 ,      SO:6
1790 ,      PA:#T
1800 ,      SO:5
1810 ,      PA:#T
1820 ,      SO:4
1830 ,      PA:#T
1840 ,      SO:3
1850 ,      PA:#T
1860 ,      SO:2
1870 ,      PA:#T
1880 ,      SO:1
1890 ,      PA:#T
1900 ,      SO:0
1910 ,      E:
2000 *UPDOWN SO:30
2010 ,      PA:#T
2020 ,      SO:1
2030 ,      PA:#T
2040 ,      SO:29
2050 ,      PA:#T
2060 ,      SO:2
2070 ,      PA:#T
2080 ,      SO:28
2090 ,      PA:#T
2100 ,      SO:3
2110 ,      PA:#T
2120 ,      SO:27
2130 ,      PA:#T
2140 ,      SO:4
2150 ,      PA:#T
2160 ,      SO:26
2170 ,      PA:#T
2180 ,      SO:5
2190 ,      PA:#T
2200 ,      SO:25
```

```
2200 ,      SO:25
2210 ,      PA:#T
2220 ,      SO:6
2230 ,      PA:#T
2240 ,      SO:24
2250 ,      PA:#T
2260 ,      SO:7
2270 ,      PA:#T
2280 ,      SO:23
2290 ,      PA:#T
2300 ,      SO:8
2310 ,      PA:#T
2320 ,      SO:22
2330 ,      PA:#T
2340 ,      SO:9
2350 ,      PA:#T
2360 ,      SO:21
2370 ,      PA:#T
2380 ,      SO:10
2390 ,      PA:#T
2400 ,      SO:20
2410 ,      PA:#T
2420 ,      SO:11
2430 ,      PA:#T
2440 ,      SO:19
2450 ,      PA:#T
2460 ,      SO:12
2470 ,      PA:#T
2480 ,      SO:18
2490 ,      PA:#T
2500 ,      SO:13
2510 ,      PA:#T
2520 ,      SO:17
2530 ,      PA:#T
2540 ,      SO:14
2550 ,      PA:#T
2560 ,      SO:16
2570 ,      PA:#T
2580 ,      SO:15
2590 ,      PA:#T
2599 ,      SO:0
2600 ,      E:
3000 *TRILL SO:25
3010 ,      PA:#T
3020 ,      SO:24
3030 ,      PA:#T
3040 ,      SO:25
3050 ,      PA:#T
3060 ,      SO:24
3070 ,      PA:#T
3080 ,      SO:25
3090 ,      PA:#T
3100 ,      SO:24
```

```
3100 ,      SO:24
3110 ,      PA:#T
3120 ,      SO:25
3130 ,      PA:#T
3140 ,      SO:24
3150 ,      PA:#T
3160 ,      SO:25
3170 ,      PA:#T
3180 ,      SO:24
3190 ,      PA:#T
3200 ,      SO:25
3210 ,      PA:#T
3220 ,      SO:24
3230 ,      PA:#T
3240 ,      SO:25
3250 ,      PA:#T
3260 ,      SO:24
3270 ,      PA:#T
3280 ,      SO:25
3290 ,      PA:#T
3300 ,      SO:24
3310 ,      PA:#T
3320 ,      SO:25
3330 ,      PA:#T
3340 ,      SO:24
3350 ,      PA:#T
3360 ,      SO:25
3370 ,      PA:#T
3380 ,      SO:24
3390 ,      PA:#T
3400 ,      SO:0
3410 ,      E:
5000 *CHEESE SO:13
5010 ,      PA:#T
5020 ,      SO:13
5030 ,      PA:#T
5040 ,      SO:15
5050 ,      PA:#T
5060 ,      SO:17
5070 ,      PA:#T
5080 ,      SO:13
5090 ,      PA:#T
5100 ,      SO:17
5110 ,      PA:#T
5120 ,      SO:15
5130 ,      PA:#T
5140 ,      SO:15
5150 ,      PA:#T
5155 ,      SO:0
5160 ,      SO:0
5170 ,      E:
5200 *TUNA SO:13
```

```
5200 *TUNA SO:13
5210 ,     PA:#T
5220 ,     SO:13
5230 ,     PA:#T
5240 ,     SO:15
5250 ,     PA:#T
5260 ,     SO:17
5270 ,     PA:#T
5280 ,     SO:13
5290 ,     PA:#T
5300 ,     SO:13
5310 ,     PA:#T
5320 ,     SO:12
5330 ,     PA:#T
5340 ,     SO:12
5350 ,     PA:#T
5355 ,     SO:0
5360 ,     E:
5400 *PONY SO:13
5410 ,     PA:#T
5420 ,     SO:13
5430 ,     PA:#T
5440 ,     SO:15
5450 ,     PA:#T
5460 ,     SO:17
5470 ,     PA:#T
5480 ,     SO:18
5490 ,     PA:#T
5500 ,     SO:17
5510 ,     PA:#T
5520 ,     SO:15
5530 ,     PA:#T
5540 ,     SO:13
5550 ,     PA:#T
5560 ,     SO:0
5570 ,     E:
5600 *RONI SO:12
5610 ,     PA:#T
5620 ,     SO:8
5630 ,     PA:#T
5640 ,     SO:10
5650 ,     PA:#T
5660 ,     SO:12
5670 ,     PA:#T
5680 ,     SO:13
5690 ,     PA:#T
5700 ,     SO:0
5710 ,     PA:#T
5720 ,     SO:13
5730 ,     PA:#T
5740 ,     SO:13
5750 ,     PA:#T
5760 ,     SO:0
5770 ,     E:
```

```
  5 U:*TITLE
 10 R:SPACESHIP
 12 PEN YELLOW; TURTLE OFF
 20 CLEAR
 40 GOTO 0,0
 50 DRAWTO 10,10
 60 DRAWTO 0,20
 70 DRAWTO 0,20
 80 DRAWTO 0,0
 90 FILLTO 0,19
100 DRAWTO -10,10
110 DRAWTO 0,0
120 PEN ERASE
130 GOTO -5,14
140 PEN YELLOW
150 FILLTO -10,10
160 FILLTO 0,1
170 GOTO -10,10
180 FILLTO 0,19
190 PEN BLUE
200 GOTO -10,10
210 DRAWTO -10,-20
220 GOTO 10,10
230 DRAWTO 10,-20
240 DRAWTO 0,-10
250 DRAWTO -10,-20
260 GOTO 10,-20
270 FILLTO 0,-10
280 FILLTO 0,0
290 FILLTO 9,9
300 GOTO -10,-20
310 FILLTO -10,10
312 GOTO47,-79
314 T:ONE DAY A SPACE SHIP CRASHED
316 T:LANDED ON PLANET MARS.
325 U:*CHINGCHANG
330 PEN RED
340 FILLTO 79,47
350 GOTO -10,-20
360 FILLTO 0,-11
370 GOTO -10,-21
380 DRAWTO 10,-20
390 DRAWTO -10,-20
400 GOTO 0,19
410 FILLTO 75,20
420 GOTO    11,-20
430 FILLTO 20,10
440 GOTO 1,20
450 FILLTO 70,20
460 GOTO 11,-20
470 GOTO 10,-20
480 FILLTO 10,10
490 FILLTO 0,20
500 GOTO 10,-20
510 DRAWTO 75,-20
520 T:AS SOON AS THE SPACE SHIP
530 T:CRASHED, IT SANK INTO RED CHEESE.
540 T:
700 U:*CHINGCHANG
```

70

```
700 U:*CHINGCHANG
710 E:
720 *CHINGCHANG
730 SO:2,11
740 PA:50
750 SO:4,14
760 PA:50
770 SO:7,16
780 PA:50
790 SO:9,19
800 PA:50
810 SO:11,19
820 PA:50
830 SO:14,23
840 PA:50
850 SO:16,26
860 PA:50
870 SO:19,28
880 PA:80
890 SO:21,31
900 PA:50
910 SO:21,28
920 PA:50
930 SO:21,31
940 PA:50
950 SO:19,28
960 PA:50
970 SO:21,31
980 PA:50
990 SO:19,28
1030 SO:14,23
1040 PA:80
1050 SO:11,21
1060 PA:80
1070 SO:9, 19
1080 PA:80
1090 SO:7,16
1100 PA:80
1110 SO:4,14
1120 PA:80
1130 SO:2,11
1140 PA:120
1150 E:
9499 *TITLE
9500 LETTERS:LARGE
9502 T:
9510 T:      aC HI
9520 PA:100
9530 SO:24
9540 PA:80
9550 SO:31
9560 PA:80
9570 SO:15
9580 PA:90
9590 SO:10
9600 PA:80
9602 LETTERS:SMALL
9610 E:
```

71

```
10 PEN YELLOW
20 C:#S=1
30 *AGAIN
40    DRAW #S
50    TURN 90
55    C:#S=#S+1
60    J:*AGAIN
```

```
 5 PEN YELLOW
10 C:#S=1
20 *REPEAT
25   U:*SPIRO
27   GO-5
28   TURN 3
40   C:#S=#S+1
50   J:*REPEAT
100 *SPIRO
110   6(DRAW 9*#S;TURN60;DRAW2*#S;TURN60;DRAW5*#S;TURN60;DRAW3*#S;TURN 60;DRAW
#S;TURN60)
120   E:
```

```
100 PEN YELLOW
105 GOTO -10,0
110 U:*SPIRO
120 GOTO -50,15
130 U:*SPIRO
140 GOTO 5,30; TURN 30
150 U:*SPIRO
160 GOTO 32,25; TURN 15
170 U:*SPIRO
180 GOTO 55,10; TURN 30
190 U:*SPIRO
200 GOTO 20,-10; NORTH
220 E:
500 *SPIRO
510    4(DRAW18;TURN90;DRAW4;TURN90;DRAW10;TURN90;DRAW5;TURN90;DRAW2;TURN90)
520    E:
```

Spiro

```
 10 PEN GREEN
100 GOTO -73,-30
110 C:#S=1
120 GOTO -72,-15
130 U:*SPIRO
140 C:#S=2
150 GOTO -62,5
160 U:*SPIRO
170 C:#S=3
180 GOTO -35,20
190 U:*SPIRO
200 C:#S=4
210 GOTO 2,10
220 U:*SPIRO
230 C:#S=5
240 GOTO 45,-12
250 U:*SPIRO
260 GOTO -20,-15
300 E:
500 *SPIRO
510    4(DRAW 9*#S;TURN90;DRAW2*#S;TURN90;DRAW5*#S;TURN90;DRAW3*#S;TURN 90;DRAW
#S;TURN90)
520    E:
```

Spiros

73

```
 10 *START
 50 T:HOW BIG A STAR WOULD YOU LIKE? \
 60 A:#S
100 T:WHAT COLOR (RED, YELLOW, OR ORANGE)?
110 A:
120 M:RED,YELLOW,ORANGE
130 JM:*RED,*YELLOW,*ORANGE
140 *RED   PEN RED
150        J:*WHERE
160 *YELLOW   PEN YELLOW
170          J:*WHERE
180 *ORANGE   PEN ORANGE
190          J:*WHERE
400 *WHERE
410    T:WHERE WOULD YOU LIKE THE STAR?
420    T:HOW FAR OVER? \
430    A:#OVER
440    T:HOW FAR UP? \
450    A:#UP
460    GOTO #OVER, #UP
470    U:*STAR
480    J:*START
500 *STAR
510    9 ( DRAW #S; TURN 40 )
520    9 ( TURN -60; DRAW #S; TURN 120; DRAW #S; TURN -20 )
530    E:
```

```
 10 ,        R: STRUM
 20 ,          LETTERS:LARGE
 50 ,         POS:1,3
 60 ,          T:COMPUTER
 70 ,          T:     SING
 80 ,          T:          ALONG
 90 ,          PA:200
100 ,        U:*SONGTITLE
110 ,      U:*SETTEMPO
120 ,      U:*SETMETER
130 ,          C:#N=0 [SETS THE COUNTS PER MEASURE]
140 ,      U:*SONG
150 E:
160 *CHORD
170 ,        C:#K=0
180 *REPEAT
190 ,      C:#X=#N\#M [#X=FIRST NOTE OF EACH CHORD, IF IT IS FIRST CHORD OF MEASU
RE IT WILL CONTAIN 3 NOTES]
200 ,        C(#X=0):#Z=#A
210 ,        C(#X<>0):#Z=0
220 ,        SO:#Z,#B,#C,#D
230 ,        PA:#T
240 ,        SO:0,0,0,0
250 ,        PA:1
260 ,        C:#K=#K+1
270 ,        C:#N=#N+1
280 ,        J(#K<#R):*REPEAT[#R IS THE NUMBER OF STRUMS OF SAME CHORD]
290 ,        E:
300 *C
310 ,    U:*BIGLETTERS
320 ,        T:    c major
330 ,        C:#A=1
340 ,        C:#B=13
350 ,        C:#C=17
360 ,        C:#D=20
370 ,    U:*CHORD
380 ,        E:
390 *F
400 ,      U:*BIGLETTERS
410 ,        T:    F MAJOR
420 ,        C:#A=6
430 ,        C:#B=18
440 ,        C:#C=22
450 ,        C:#D=25
460 ,    U:*CHORD
470 ,        E:
480 *C7
490 ,      U:*BIGLETTERS
500 ,        T:, C 7
510 ,        C:#A=13
520 ,        C:#B=17
530 ,        C:#C=20
540 ,        C:#D=23
550 ,    U:*CHORD
560 ,        E:
570 *CSHARP7
580 ,      U:*BIGLETTERS
590 ,        T:   C SHARP 7
600 ,        C:#A=14
```

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```
 600 ,    C:#A=14
 610 ,    C:#B=18
 620 ,    C:#C=21
 630 ,    C:#D=24
 640 ,    U:*CHORD
 650 ,    E:
 660 *D
 670 ,    U:*BIGLETTERS
 680 ,    T:    ▪ ▪ ▪
 690 ,    C:#A=15
 700 ,    C:#B=19
 710 ,    C:#C=22
 720 ,    C:#D=0
 730 ,    U:*CHORD
 740 ,    E:
 750 *D7
 760 ,    U:*BIGLETTERS
 770 ,    T:      ▪
 780 ,    C:#A=15
 790 ,    C:#B=19
 800 ,    C:#C=22
 810 ,    C:#D=25
 820 ,    U:*CHORD
 830 ,    E:
 840 *E
 850 ,    U:*BIGLETTERS
 860 ,    C:#A=17
 870 ,    C:#B=21
 880 ,    C:#C=24
 890 ,    C:#D=0
 900 ,    U:*CHORD
 910 ,    E:
 920 *E7
 930 ,    U:*BIGLETTERS
 940 ,    T:    e 7
 950 ,    C:#A=17
 960 ,    C:#B=21
 970 ,    C:#C=24
 980 ,    C:#D=27
 990 ,    U:*CHORD
1000 ,    E:
1010 *E7MIN
1020 ,    U:*BIGLETTERS
1030 ,    T:    E 7 MINOR
1040 ,    C:#A=17
1050 ,    C:#B=20
1060 ,    C:#C=24
1070 ,    C:#D=27
1080 ,    U:*CHORD
1090 ,    E:
1100 *F
1110 ,    U:*BIGLETTERS
1120 ,    T:    F MAJOR
1130 ,    C:#A=18
1140 ,    C:#B=22
1150 ,    C:#C=25
1160 ,    C:#D=0
1170 ,    U:*CHORD
1180 ,    E:
1190 *FSHARPMINOR
1200 ,    U:*BIGLETTERS
```

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```
1200 ,    U:*BIGLETTERS
1210 ,    T:    f sharp minor
1220 ,    C:#A=19
1230 ,    C:#B=22
1240 ,    C:#C=26
1250 ,    C:#D=0
1260 ,    U:*CHORD
1270 ,    E:
1280 *G
1290 ,    U:*BIGLETTERS
1300 ,    T:
1310 ,    C:#A=20
1320 ,    C:#B=24
1330 ,    C:#C=27
1340 ,    C:#D=0
1350 ,    U:*CHORD
1360 ,    E:
1370 *G7
1380 ,    U:*BIGLETTERS
1390 ,    T:
1400 ,    C:#A=20
1410 ,    C:#A=24
1420 ,    C:#C=27
1430 ,    C:#D=30
1440 ,    U:*CHORD
1450 ,    E:
1460 *A
1470 ,    U:*BIGLETTERS
1480 ,    T:    A MAJOR
1490 ,    C:#A=10
1500 ,    C:#B=14
1510 ,     C:#C=17
1520 ,    C:#D=0
1530 ,    U:*CHORD
1540 ,    E:
1550 *A7
1560 ,    U:*BIGLETTERS
1570 ,    T:    a 7
1580 ,    C:#A=10
1590 ,    C:#B=14
1600 ,    C:#C=17
1610 ,    A:$Y
1620 ,    U:*CHORD
1630 ,    E:
1640 *BFLAT
1650 ,    U:*BIGLETTERS
1660 ,    T:
1670 ,    C:#A=11
1680 ,    C:#B=15
1690 ,    C:#C=18
1700 ,    C:#D=0
1710 ,    M:Y
1720 ,    E:
1730 *B7
1740 ,    U:*BIGLETTERS
1750 ,    T:
1760 ,    C:#A=12
1770 ,    C:#B=16
1780 ,    C:#C=19
1790 ,    C:#D=22
1800 ,    U:*CHORD
```

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```
1800 ,    U:*CHORD
1810 ,    JY:*SONG
1820 *BIGLETTERS
 840 ,       LETTERS:LARGE
1850 ,    T:,}
1860 ,    T:
1870 ,    T:
1880 ,    T:
1890 ,    E:
1900 EN:
1910 E:
1920 *SETTEMPO
1930 ,    U:*SHOWTEMPOS
1940 ,       T:
1950 ,          T: WHAT TEMPO?
1960 *INTEMP
1970 ,       A:$TEMPO
1980 ,       M: LA, AN, MO, AL, PR
1990 ,        JN:*SETTEMPO
2000 ,        JM:*LARGO,*ANDANTE,*MODERATO,*ALLEGRO,*PRESTO
2010 *LARGO
2020 ,       C:#T=52 [SETS THE LENGTH OF TIME EACH CHORD IS HELD]
2030 ,       E:
2040 *ANDANTE
2050 ,       C:#T=42
2060 ,       E:
2070 *MODERATO
2080 ,       C:#T=32
2090 ,       E:
2100 *ALLEGRO
2110 ,       C:#T=22
2120 ,     E:
2130 *PRESTO
2140 ,       C:#T=12
2150 ,       E:
2160 *SHOWTEMPOS
2170 ,     T:,}
2190 ,       QUIT
2200 ,       POS:0,2
2210 ,       T:TEMPO IDENTIFICATION
2220 ,       T:
2230 ,       T:LARGO    - VERY SLOW
2240 ,       T:ANDANTE - SLOW
2250 ,       T:MODERATO- MODERATE
2260 ,       T:ALLEGRO - FAST
2270 ,       T:PRESTO   - VERY FAST
2280 ,       E:
2290 *SONGTITLE
2300 ,     T:, }
2320 ,       POS:0,0
2330 ,    U:*TITLE
2340 ,       T:
2350 ,       T:
2360 ,       T:   $TITLE
2370 ,       T:
2380 ,       T:
2390 ,       T:
2400 ,       PA: 200
```

```
2400 ,     PA: 200
2410 ,     E:
2420 *SETMETER
2440 ,     QUIT
2450 ,     T:, }
2460 ,     T:  what is the meter?
2470 ,     A:#M [HOW MANY BEATS PER MEASURE]
2480 ,   U(#M<2):*SETMETER
2490 ,   U(#M=5):*SETMETER
2500 ,   U(#M>6):*SETMETER
2510 ,     C(#M=6):#M=3
2520 E:
2530 *QUESTION
2535 ,     QUIT
2540 ,     T:Do you want to hear $TITLE again?
2550 ,     A:$Y
2560 ,   M:Y
2570 ,     JY:*SONG
2580 EN:
2590 E:
2600 *TITLE
2610 A: $TITLE= BLUE TAIL FLY
2620 E:
2630 *SONG
2640 C:#R=4
2650 U:*C
2660 C:#R=8
2670 U:*G7
2680 C:#R=8
2690 U:*C
2700 C:#R=4
2710 U:*F
2720 C:#R=4
2730 U:*G7
2740 C:#R=4
2750 U:*C
2760 U:*QUESTION
2770 E:
```

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```
100 GO 40; TURN 150
110 PEN BLUE
120 DRAW 40
130 PEN RED
140 DRAW 40; TURN 120; DRAW 40; TURN 90; FILL 34; GO -34; TURN -90; GO 1
150 PEN YELLOW
160 DRAW 39; TURN 120; FILL 40
170 PEN BLUE
180 FILL 39
190 TURTLE OFF
200 *CHANGECOLORS
210     CHANGE BLUE,PURPLE
220     CHANGE RED,ORANGE
230     CHANGE YELLOW,GREEN
235     PA:10
240     CHANGE PURPLE,RED
250     CHANGE ORANGE,YELLOW
260     CHANGE GREEN,BLUE
270     PA:10
300   J:*CHANGECOLORS
```

```
  1 PEN YELLOW; TURTLE OFF
 20 GR:GOTO-75,40
 30 GR:DRAWTO-25,40
 40 GR:DRAWTO-25,-20
 50 GR:DRAWTO-75,-20
 60 GR:DRAWTO-75,40
 70 GR:GOTO-55,-20
 80 GR:DRAWTO-55,0
 90 GR:DRAWTO-45,0
100 GR:DRAWTO-45,-20
110 GR:GOTO-25,20
120 GR:DRAWTO20,20
130 GR:DRAWTO20,-20
140 GR:DRAWTO-25,-20
150 GR:PEN RED
160 GR: GOTO-15,-20
170 GR:DRAWTO-15,0
180 GR:DRAWTO5,0
190 GR:DRAWTO5,-20
200 GR:GOTO20,10
210 GR:DRAWTO60,10
220 GR:DRAWTO60,-20
230 GR:DRAWTO20,-20
240 GR:PEN BLUE
250 GR:GOTO30,-20
260 GR:DRAWTO30,5
270 GR:DRAWTO50,5
280 GR:DRAWTO50,-20
290 T:THERE ONCE WAS A· TOWN NAMED
300 T:SCOTTSTOWN.
310 PA:200
320 GR:CLEAR
330 PA:30
340 GR:GOTO-75,-31
350 GR:DRAWTO-75,30
360 GR:DRAWTO-25,30
370 GR:DRAWTO-25,-31
380 GR:GOTO-65,-31
390 GR:DRAWTO-65,-10
400 GR:DRAWTO-35,-10
410 GR:DRAWTO-35,-31
420 GR:GOTO-65,10
430 GR:DRAWTO-65,20
440 GR:DRAWTO-55,20
450 GR:DRAWTO-55,10
460 GR:DRAWTO-65,10
470 GR:GOTO-45,10
480 GR:DRAWTO-45,20
490 GR:DRAWTO-35,20
500 GR:DRAWTO-35,10
520 GR:GOTO30,-31
530 GR:DRAWTO30,30
540 GR:DRAWTO79,30
550 GR:GOTO40,-31
560 GR:DRAWTO40,-10
570 GR:DRAWTO70,-10
580 GR:DRAWTO70,-31
590 GR:GOTO40,10
600 GR:DRAWTO40,20
```

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```
 600 GR:DRAWTO40,20
 610 GR:DRAWTO50,20
 620 GR:DRAWTO50,10
 630 GR:DRAWTO40,10
 640 GR:GOTO60,10
 650 GR:DRAWTO60,20
 660 GR:DRAWTO70,20
 670 GR:DRAWTO70,10
 680 GR:DRAWTO60,10
 690 T:AND IN THIS TOWN WERE TWO HOUSES
 700 T:THAT LOOKED JUST ALIKE.
 710 PA:250
 720 GR:CLEAR
 730 PA:30
 740 GR:GOTO-40,-10
 750 GR:PENRED
 760 GR:DRAWTO-30,10
 770 GR:DRAWTO-40,10
 780 GR:DRAWTO-40,20
 790 GR:DRAWTO-30,20
 800 GR:PEN RED
 810 GR:DRAWTO-25,20
 820 GR:DRAWTO-25,25
 830 GR:GOTO-15,25
 840 GR:DRAWTO-15,20
 850 GR:DRAWTO0,20
 860 GR:DRAWTO0,10
 870 GR:DRAWTO-10,10
 880 GR:DRAWTO0,-10
 890 GR:DRAWTO-40,-10
 900 GR:GOTO-30,-10
 910 GR:DRAWTO-30,-25
 920 GR:DRAWTO-35,-25
 930 GR:DRAWTO-35,-30
 940 GR:DRAWTO-25,-30
 950 GR:DRAWTO-25,-10
 960 GR:GOTO-20,-10
 970 GR:DRAWTO-20,-30
 980 GR:DRAWTO-10,-30
 990 GR:DRAWTO-10,-25
1000 GR:DRAWTO-15,-25
1010 GR:DRAWTO-15,-10
1020 GR:GOTO20,-10
1030 GR:PEN YELLOW
1040 GR:DRAWTO30,10
1050 GR:DRAWTO20,10
1060 GR:DRAWTO20,20
1070 GR:DRAWTO30,20
1080 GR:DRAWTO35,20
1090 GR:DRAWTO35, 25
1100 GR:GOTO45,25
1110 GR:DRAWTO45,20
1120 GR:DRAWTO60,20
1130 GR:DRAWTO60,10
1140 GR:DRAWTO50,10
1150 GR:DRAWTO60,-10
1160 GR:DRAWTO20,-10
1170 GR:GOTO30,-10
1180 GR:DRAWTO30,-25
1190 GR:DRAWTO25,-25
1200 GR:DRAWTO25,-30
```

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```
1200 GR:DRAWTO25,-30
1210 GR:DRAWTO35,-30
1220 GR:DRAWTO35,-10
1230 GR:GOTO40,-10
1240 GR:DRAWTO40,-30
1250 GR:DRAWTO50,-30
1260 GR:DRAWTO50,-25
1270 GR:DRAWTO45,-25
1280 GR:DRAWTO45,-10
1290 GR:PEN RED
1300 GR:GOTO-30,35
1310 GR:70 (DRAW1;TURN5)
1320 GR:PEN YELLOW
1330 GR:GOTO30,32
1340 GR:70 (DRAW1;TURN5)
1350 T:AND INSIDE THESE TWO HOUSES
1360 PA:200
1370 T:WERE TWO LITTLE GIRLS WHO
1380 PA:200
1390 T:LIVED INSIDE.
1400 PA:200
1410 GR:CLEAR
1420 PA:30
1430 GR:GOTO-25,-15
1440 GR:DRAWTO-40,-31
1450 GR:GOTO-25,-15
1460 GR:PEN BLUE
1470 GR:DRAWTO-10,-31
1480 GR:PENRED
1490 GR:GOTO-25,-15
1500 GR:DRAWTO-25,10
1510 GR:GOTO-25,-5
1520 GR:DRAWTO-50,15
1530 GR:GOTO-25,-5
1540 GR:DRAWTO-10,15
1550 GR:GOTO-35,20
1560 GR:70(DRAW1;TURN5)
1570 GR:GOTO20,-31
1580 GR:PENRED
1590 GR:DRAWTO40,-10
1600 GR:GOTO60,-31
1610 GR:DRAWTO40,-10
1620 GR:PENBLUE
1630 GR:GOTO40,-10
1640 GR:DRAWTO40,10
1650 GR:PEN YELLOW
1660 GR:GOTO40,-5
1670 GR:DRAWTO20,20
1680 GR:GOTO40,-5
1690 GR:DRAWTO60,20
1700 GR:GOTO30,20
1710 GR:70 (DRAW1;TURN5)
1720 T:AND IN THESE LIVES OF THE TWO
1730 PA:250
1740 T:GIRLS WHO LOOKED ALIKE WHO
1750 PA:250
1760 T:LIVED IN HOUSES THAT LOOKED
1770 PA:250
1780 T:ALIKE ,WAS TWO BOYS WHO LOOKED
1790 PA:250
1800 T:ALIKE.
```

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```
1800 T:ALIKE.
1810 PA:250
1820 GR:CLEAR
1830 PA:30
1840 GR:GOTO-70,-20
1850 GR:DRAWTO-70,20
1860 GR:DRAWTO-10,20
1870 GR:DRAWTO-10,-20
1880 GR:DRAWTO-70,-20
1890 GR:GOTO-40,20
1900 GR:DRAWTO-40,45
1910 GR:GOTO-50,35
1920 GR:DRAWTO-30,35
1930 GR:GOTO-50,-20
1940 GR:DRAWTO-50,0
1950 GR:DRAWTO-30,0
1960 GR:DRAWTO-30,-20
1970 GR:GOTO-60,0
1980 GR:GOTO10,-20
1990 GR:DRAWTO10,20
2000 GR:DRAWTO60,20
2010 GR:DRAWTO60,-20
2020 GR:DRAWTO10,-20
2030 GR:GOTO 40,20
2040 GR:DRAWTO40,45
2050 GR:GOTO30,35
2060 GR:DRAWTO50,35
2070 GR:GOTO30,-20
2080 GR:DRAWTO30,0
2090 GR:DRAWTO50,0
3000 GR:DRAWTO50,-20
3010 T:AND THE TWO GIRLS THAT LOOKED
3020 PA:250
3030 T:ALIKE,THAT LIVED IN TWO HOUSES
3040 PA:250
3050 T:THAT LOOKED ALIKE THAT LOVED
3060 PA:250
3070 T:TWO BOYS THAT LOOKED ALIKE
3080 PA:250
3090 T:GOT MARRIED IN TWO DIFFERENT
4000 PA:250
4010 T:CHURCHES THAT LOOKED ALIKE.
4020 PA:250
4030 T:WHAT A HAPPY EVENT.
4040 PA:250
4050 T:WRITTEN AND DRAWN BY VICKY
4060 PA:250
```

```
 20 FULL
 30 TURN 5
 40 BACKGROUND BLUE
 50 SPEED:1
 60 PEN SILVER
 70 C:#T=10
 80 *START
 90    TURN 24
110    U:*TRI
120    C:#T=#T+1
130  J:*START
170 *TRI
180   GR:3(DRAW#T;TURN120)
190   E:
```

```
   1 CLEAR
   5 PEN YELLOW; TURTLE OFF
  10 U:*SHIELDS
  20 U:*TANK
  25 U:*MUSIC
  30 U:*TEXT
  32 GOTO30,0
  35 U:*PERSON
  40 U:*FIRE
  50 U:*PERSONERASE
  60 U:*MISSHOT
  65 U:*PERSONERASETWO
  80 U:*LINERASE
  85 PENYELLOW
  90 U:*ARMY
 100 U:*MUSIC
 105 U:*SHOTTWO
 110 U:*TANKERASE
 999 E:
1000 *PERSON
1010 PA:#T
1020 4(DRAW7;TURN90)
1030 GO5;TURN90;GO2;GO3
1040 TURN90;GO3;TURN90;DRAW3
1050 GO-1;TURN-90;GO2
1060 DRAW10
1070 TURN45;DRAW8
1080 GO-8;TURN-90;DRAW8;GO-8
1090 TURN225;GO7
1100 TURN90;GO7;TURN180;DRAW14
1110 E:
1160 *TANK
1170 GOTO-70,0
1180 DRAWTO-70,-10
1190 DRAWTO-30,-10
1200 DRAWTO-20,0
1210 DRAWTO-30,10
1220 DRAWTO-60,10
1230 DRAWTO-70,0
1240 E:
1250 *SHIELDS
1260 GOTO -79,40
1270 DRAWTO79,40
1280 GOTO-79,-30
1290 DRAWTO79,-30
1300 E:
1310 *FIRE
1320 GOTO-20,0
1330 DRAWTO28,0
1340 DRAWTO 30,0
1345 DRAWTO 29,0
1350 PENERASE
1355 DRAWTO31,0
1360 DRAWTO29,0
1365 DRAWTO-18,0
1367 E:
1370 *PERSONERASE
1375 PA:16
1380 GOTO30,0
1390 TURNTO0
1400 PENERASE
```

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```
1400 PENERASE
1410 U:*PERSON
1420 TURNTO90
1430 PEN YELLOW
1440 GOTO40,-10
1450 U:*PERSON
1460 E:
1470 *MISSHOT
1480 GOTO-18,0
1485 TURNTO 45
1490 DRAW   53
1500 *DOWN SO:20
1503 DRAW1
1505 PA:0
1506 TURN180
1510 PA:#T
1520 DRAW 55
1530 PA:#T
1540 SO:18
1545 PEN YELLOW
1550 GOTO19,37
1560 DRAWTO38,-9
1562 E:
1570 *PERSONERASETWO
1580 PA:10
1590 GOTO40,-10
1600 TURNTO90
1610 PENERASE
1620 U:*PERSON
1625 PEN YELLOW
1630 E:
1640 *LINERASE
1645 PEN ERASE
1647 PA:0
1650 GOTO19,37
1660 DRAWTO38,-9
1670 GOTO-18,0
1680 TURNTO45
1690 DRAW55
1700 DRAW1
1710 TURN180
1720 DRAW55
1725 E:
2000 *TEXT
2003 T:ZOLTAR VERSES MYROW
2005 U:*TRILL
2010 T:THE PLANET OF ZOLTAR THE GREAT
2011 U:*RONI
2015 PA:50
2020 T:HAS BEEN INVADED.
2021 U:*PONY
2025 PA:50
2030 T:AND NOW ZOLTAR MUST STOP MYROW
2031 U:*TUNA
2035 PA:50
2040 T:FROM DISTROYING THE PLANET.
2041 U:*TRILL
2045 PA:50
2050 T:ZOLTAR KNOWS THAT HE MUST
```

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```
2050 T:ZOLTAR KNOWS THAT HE MUST
2051 U:*RONI
2055 PA:50
2060 T:ATTACK MYROW WHEN HE IS OFF
2061 U:*PONY
2065 PA:50
2070 T:GUARD.THE RISK THAT ZOLTAR IS
2071 U:*TUNA
2075 PA:50
2080 T:TAKING IS A GREAT ONE.IF MYROW
2081 U:*RONI
2085 PA:50
2090 T:FINDS OUT ABOUT HIS PLAN THE
2091 U:*PONY
2100 PA:50
2110 T:PLANET WILL BE DISTROYED.
2111 U:*TRILL
2120 T:ONE DAY MYROW WAS WALKING ALONE
2121 U:*TUNA
2125 PA:50
2130 T:ON HIS PLANET.ZOLTAR WAS WAITING
2131 U:*PONY
2135 PA:50
2140 T:KNOWS THE ATTACK MUST BE NOW OR
2141 U:*RONI
2145 PA:50
2150 T:NEVER!
2151 U:*TRILL
2160     SO:26
2170     PA:#T
2180     SO:5
2190     PA:#T
2200     SO:25
2210   . PA:#T
2240     SO:24
2250     PA:#T
2260     SO:7
2270     PA:#T
2280     SO:23
2290     PA:#T
2300     SO:8
2310     PA:#T
2320     SO:22
2330     PA:#T
2340     SO:9
2350     PA:#T
2360     SO:21
2370     PA:#T
2380     SO:10
2390     PA:#T
2400     SO:20
2410     PA:#T
2420     SO:11
2430     PA:#T
2440     SO:19
2450     PA:#T
2460     SO:12
2470     PA:#T
2480     SO:18
2490     PA:#T
2500     SO:13
```

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```
2500     SO:13
2510     PA:#T
2520     SO:17
2530     PA:#T
2540     SO:14
2550     PA:#T
2560     SO:16
2570     PA:#T
2580     SO:15
2590     PA:#T
2599     SO:0
2600 ,      E:
4000 *ARMY
4001 TURNTO 0
4004 TURN-45
4005 TURN90
4007 TURN45
4008 TURN90
4009 TURN180
4010 GOTO70,0
4015 U:*PERSON
4020 GOTO50,0
4021 TURN90
4025 U:*PERSON
4028 TURNTOO
4030 GOTO30,0
4040 U:*PERSON
4041 E:
4042 *SHOTTWO
4043 PEN RED
4045 DRAW48
4046 TURNTO270
4047 PA:180
4048 PENERASE
4049 DRAW1
4050 TURN180
4051 DRAW49
4055 E:
4080 *TANKGONE
4999 *MUSIC
5000 C:#T=7
5010 U:*TRILL
5012 U:*TUNA
5014 U:*PONY
5016 U:*RONI
5025 E:
5029 *TRILL
5030     PA:#T
5040     SO:15
5050     PA:#T
5060     SO:17
5070     PA:#T
5080     SO:13
5090     PA:#T
5100     SO:17
5110     PA:#T
5120     SO:15
5130     PA:#T
5140     SO:15
5150     PA:#T
5155     SO:0
5170     E:
5200 *TUNA SO:13
```

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```
5200 *TUNA SO:13
5210     PA:#T
5220     SO:13
5230     PA:#T
5240     SO:15
5250     PA:#T
5260     SO:17
5270     PA:#T
5280     SO:13
5290     PA:#T
5300     SO:13
5310     PA:#T
5320     SO:12
5330     PA:#T
5340     SO:12
5350     PA:#T
5355     SO:0
5360   E:
5400 *PONY SO:13
5410     PA:#T
5420     SO:13
5430     PA:#T
5440     SO:15
5450     PA:#T
5460     SO:17
5470     PA:#T
5480     SO:18
5490     PA:#T
5500     SO:17
5510     PA:#T
5520     SO:15
5530     PA:#T
5540     SO:13
5550    PA:#T
5560     SO:0
5570   E:
5600 *RONI SO:12
5610 ,      PA:#T
5620 ,      SO:8
5630 ,      PA:#T
5640 ,      SO:10
5650 ,      PA:#T
5660 ,      SO:12
5670 ,      PA:#T
5680 ,      SO:13
5690 ,      PA:#T
5700 ,      SO:0
5710 ,      PA:#T
5720 ,      SO:13
5730 ,      PA:#T
5740 ,      SO:13
5750 ,      PA:#T
5760 ,      SO:0
5770   E:
5999 *TANKERASE
6000 GR:PEN ERASE
6010 U:*TANK
6020 E:
```

90

Many children want to learn programming so they can
write their own video games. The material in this book has
been designed to help them do just that. In the process of
achieving this goal they will learn to use many of the
fundamental concepts of computer science while creating their
own stories and games. They will learn to use string
variables while writing madlib stories; conditional branches
with riddles and branching stories; and numeric variables and
loops with number guessing games.

It is expected though not essential that campers using
this curriculum will have had some previous programming
experience. No prior experience with PILOT is necessary, but
the pace at which the materail proceeds may be too swift for
someone who has never written even the simplest program.

Some parts of the curriculum include applications
involving some of the music and turtle graphics material
presented in Book 1. This material can be used to enhance
the camper's programs and broaden their understanding, but
the curriculum as a whole does not depend on any familiarity
with it. How much these applications are used should depend
on the background and interests of the individual campers.

The curriculum is divided into seven sequential units.
In each unit a new concept is introduced with several diverse
examples of ways in which it can be applied. After exploring
these examples the campers will create their own
applications. Each unit includes a range of additional
challenges involving the same concept. It is not essential
to do the challenges in order to understand later units in
the sequence, however spending some time on them should
strengthen the campers' grasp of the concept being covered.
How much time is spent should depend on the interests of the
campers, how quickly they comprehend the new material, and
how many of the units you are trying to cover. It is not
necessary to complete all seven units in two weeks of camp.

The challenges also provide plenty of materail for
campers who have already studied some of these concepts or
are repeating the course. Many of the projects that are
suggested could take several days to complete. They are
open-ended in nature and subject primarily to the limits of
the campers' interest and imagination. A diverse range of
applications has been suggested in the hope that each camper
will be inspired to produce some project of particular
interest to him or her.

OUTLINE FOR BOOK 2
ATARI SUMMER CAMP CURRICULUM 1983

    This includes an introduction to variables, conditionals,
and loops through madlib stories, illustrated riddles,
animation, and games.

SESSION   MATERIAL
   1   Unit 1. General Introduction. Run samples of the
            kind of projects we will be doing.
   2   Unit 2. Madlib stories and string variables.
   3   Unit 2. Illustration of stories using character
            graphics.
   4   Bank Street Writer. Send a letter home. Finish
            stories.
   5   Unit 3. Riddles. The Match statement.
   6   Unit 3. Riddles. Giving clues and keeping score.
   7   Unit 3. Word games and branching stories.
   8   Unit 4. Numeric guessing games. General
            conditional statements.
   9   Unit 4. Counting loops. Number sequences.
  10   Unit 5. Applications of randomness. Random
            numbers in defined ranges.
  11   Unit 5. Random word selection and random story
            elements. Randomness in games.
  12   Unit 6. Static animation and placement of images
            anywhere on the screen.
  13   Unit 6. Movement of images. Design of projects.
  14   Unit 6. The robot turtle. Review of turtle
            graphics. Animation in turtle graphics.
  15   Unit 7. Control of animation from the keyboard or
            a joystick. Timing of input. Joystick control of
            the turtle.
  16   Unit 7. Simple adventure games. Passing
            information.
17 - 18   Finish projects.

	PILOT	BASIC
To save to the disk	SAVE D:NAME	SAVE"D:NAME
To run a program from disk	RUN D:NAME	RUN"D:NAME
To load from the disk	LOAD D:NAME	LOAD"D:NAME
To list to the printer	SAVE P:	LIST "P:
To save a piece of a program	SAVE D:NAME line#,line#	LIST "D:NAME", line#, line#
To retrieve same piece	MERGE D:NAME or APPEND D:NAME (APPEND renumbers the appended program to follow the current program.)	ENTER"D:NAME" (ENTER merges the text with the current program.)

To use the Epson printer for (picture) screen dumping the computer must be turned off, insert the macrotronics disk, turn on the computer, when question is asked PRINTER (0-4)? type 3. Remove disk and load the program you wish to copy. When picture is on screen and stopped on screen, type CTRL P.

Book 2 Unit 1 Introduction to Each Other and the Curriculum

Time - 1 session

Key Concepts

    Introduction to instructors and each other
    Types of programs we will be writing

Prerequisites

    Familarity with the notion of a program as a sequence of
        instructions
    Experience typing in and making changes in programs

New Statements

    LOAD   \
    RUN   >   in BASIC and PILOT
    NEW   /

Materials

    Personal program disks
    BASIC cartridges
    Notes to the Instructors
    Instruction sheet for personal and mystery person data
        base
    PILOT II Disk
    PILOT Book 2 Utility Disk: INCIDENT, SAPHIRE, STRGUESS,
        INOUT, SPHINX
    Control Graphics Keyboard Picture

Book 2 Unit 1

Activity Outline

1.   Instructors should introduce themselves to the
      campers in the class.

2.   Have campers insert ATARI BASIC cartridges into
      their computers and then RUN the PERSONAL program
      on the Personal program disk. Follow the
      instructions on the personal program instruction
      sheet for using the PERSONAL and MYSTERY PERSON
      program.

3.   Tell the campers that they will be writing stories,
      riddles, and games in the PILOT programming
      language. As examples of the kinds of programs
      they might write by the end of camp have them run
      some of these programs:
                  INCIDENT
                  SAPHIRE
                  STRGUESS
                  INOUT
                  SPHINX
      Encourage them to explore these programs and others
      on the disk at their leisure. They should also
      start thinking about possible content ideas for
      similar games and stories of their own.

Book 2   Unit 1

Challenges

1.   See what pictures you can make on the screen in the
     ATARI Memo Pad. (To do this turn on the computer
     without a disk or a cartridge.)

2.   Start planning a madlib story.

Teaching Tips

1.   Before running the PILOT programs the campers will
     need to take the BASIC cartridges out of their
     machines and boot the PILOT II disk. Then the Book
     2 Utility disk can be inserted and the programs can
     be run.

CONTROL GRAPHICS KEYBOARD

7
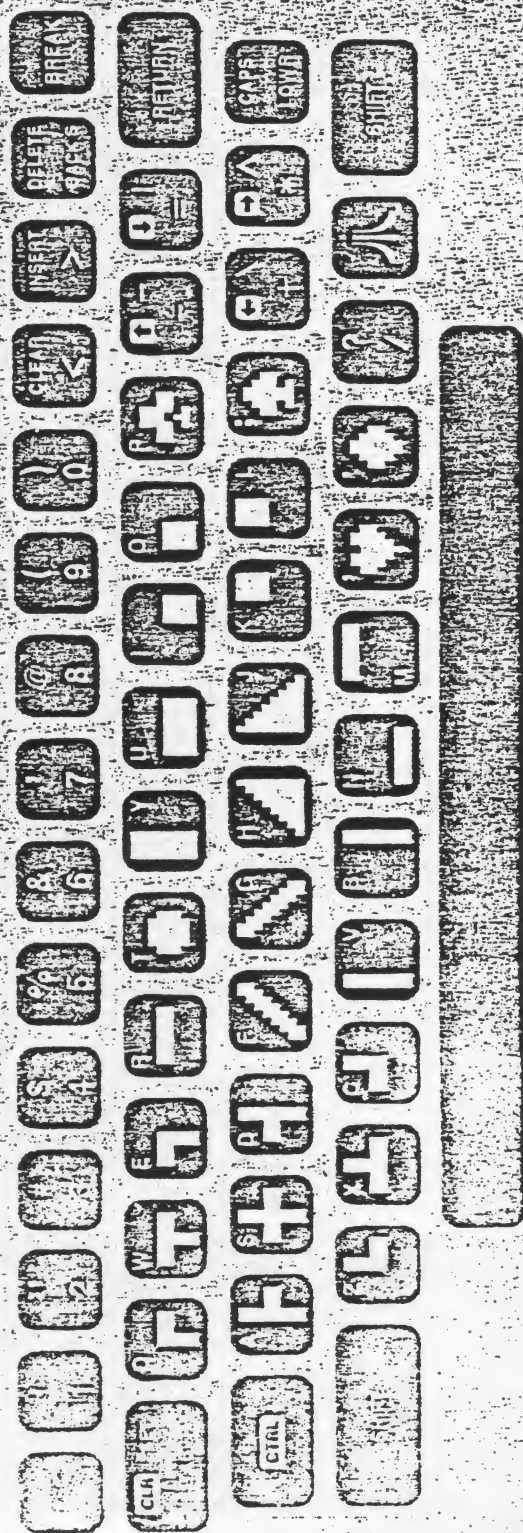
Book 2 Unit 2   Madlib stories

Estimated Time: 3-4 sessions

Key Concepts

        String variables
        Character graphics
        Screen layout and presentation of graphic and textual
            information
        Story writing

Prerequisites

        Familiarity with the concept of a program as an editable
            sequence of instructions
        Familiarity with the ATARI keyboard
        Familiarity with program editing
        Familiarity with the LOAD, SAVE, and RUN commands on the
            ATARI

New Statements

        T: T:...↓←←..   A:$string variable
        U: REN   LETTERS:large, medium, or small

Materials

        PILOT Book 2 utility disk: MADCAMP, FRANK, BASKET,
            TALE, JINGLE, INCIDENT, PICTURE, LETTERS
        Mad Lib books

Activity Outline

1.   Have the campers LOAD and RUN the following
     examples on the disk: MADCAMP, FRANK, BASKET,
     TALE, JINGLE.
2.   Explain that the campers will be writing similar
     stories of their own. The two things they need to
     know to do this are how to make text appear on the
     screen (T:) and how to store answers to questions
     and use these answers as part of the text
     (A:$string and T:$string.) Varying degrees of
     explanation of these two points will be needed
     depending on the experience and sophistication of
     the campers. Some possibilities for this are
     suggested in the teaching tips below.
3.   Help campers create their own stories. Explain
     LARGE and MEDIUM letters to those who are
     interested.
4.   Have the campers create illustrations for their
     stories using character graphics. Put pictures of
     more than a few lines in separate modules and use
     the U: statement to display them.
5.   Help the campers learn to use the POSition
     statement to format their stories and graphics so
     that they are easy to read. Be sure they use the
     RETURN key to control paging. The screen is
     cleared in a program by typing T:, pressing ESC,
     and then pressing SHIFT CLEAR.

Challenges

1. Campers interested in forming plurals, compound
    words, and other combined strings can be refered to
    the FRANK program where strings are concatenated to
    form $ANIMALS from $ANIMAL and S.
2. Stories can also be illustrated with turtle
    graphics, but there is less room for text on the
    split screen.
3. Stories can be enhanced with sound effects and
    music. Campers unfamiliar with SO: and PA: can
    exploe the material from Book 1, Units 3 and 4.
4. Campers anxious to explore animation can follow the
    style used to blink the stars in JINGLE.
5. Point out the differences in the way the two
    illustrations in MADCAMP are printed. In
    particular call attention to the use of the cursor
    control arrows in lines 470 to 474 which reposition
    the cursor before the next line is printed. (These
    can be printed in a T: statement by first pressing
    ESC and then CTRL and the arrow key. When the
    program is run the computer moves the cursor
    instead of printing the arrows.) These make it
    easy to place the picture any place on the screen
    by changing only the POS statement on line 460.
    Encourage the campers to explore putting the same
    picture in several different places on the screen
    using this technique.
6. Campers already familiar with the M: statement
    should be able to make their programs gender
    specific. For example, FRANK currently refers to
    the camper as he. This can be improved by adding
    the following lines:
                212 POS:2,17
                214 T:ARE YOU A BOY? \
                216 A:
                218 M:Y
                220 CY:$HE=He
                222 CN:$HE=She
    and changing the instances of 'he' in lines 330 and
    430 to $HE.
7. Campers already familiar with the random function
    can add random elements to their stories as in
    INCIDENT. In addition to making individual words
    depend on a random choice whole paragraphs and the
    outcome of the story can depend on randomness or on
    answers to questions preceeding the story.
8. Campers with previous experience in character
    animation can add animation to their stories as in
    INCIDENT.

Book 2   Unit 2

Challenges

9.   Sophisticated programmers may be interested in
      exploring lists using the LETTERS program. First
      they should RUN and LIST it. Then they might try
      the following problems:
           a.   Only print the first letter of the word.
           b.   Only print the fourth letter of the word.
           c.   Print every other letter in the word.
           d.   Only print the last letter in the word.
           e.   Count how many letters there are in the
                 word.
           f.   Count how many times the letter E appears
                 in the word.
           g.   Separate the word into vowels and
                 consonants.
           h.   Print the word out backward.

Teaching Tips

1.   The technical points that need to be covered for
      writing mad lib stories can be summarized by
      listing and discussing lines 20 to 60 and 360 to
      380 in the BASKET program. For campers with a
      minimum of experience it may be a good idea to have
      them first print a short paragraph using just T: to
      get familiar with how it works.
2.   It may be helpful to demonstrate the storage of
      information with variables by putting the variable
      names (e.g. $SCHOOL, $ANIMAL, etc.) on some boxes
      and then running through the program line by line
      using the START key. When a variable name appears
      in an A: statement the answer can be written on a
      slip of paper and put in the box with that variable
      name. When a variable name appears in a T:
      statement, look in the box to see what value the
      variable has. (If the box is empty PILOT types the
      variable name.)
3.   People are often confused when first trying to
      write an interactive story because it is difficult
      to put oneself in the position of the reader of the
      story. The situation is analagous to that of
      children first learning to write. They can't
      appreciate the point of view of someone trying to
      read what they are writing. A fairly direct way of
      dealing with this problem is to encourage them to
      make their first story short so they can quickly
      get to the point of seeing someone else react to
      it. Nursery rhymes are a good source of material
      for short madlibs.

Book 2 Unit 2

Teaching Tips

4.   One of the simplest approaches to drawing character
        graphics illustrations is to clear the screen and
        then design a pictue using standard and control
        chaacters. Inverse characters can be created using
        the ATARI key (⅃Ⅼ). Characters can be erased
        using the space bar. The cursor should be moved
        with the control arrows. DON'T press the RETURN
        key or PILOT will try to interpret your picture and
        print an error message in it.
        Once a satisfactory picture has been created line
        numbers and T: statements should be printed at the
        beginning of each line. If there isn't enough room
        for these statements the insert key can be used to
        move each line of the picture to the right. If
        this is confusing another approach is to load and
        list the program PICTURE which will put line
        numbers and T: statements on the screen before the
        picture is drawn. In either case it does not
        matter where on the screen the picture is created.
        Each line of the picture can be moved left or right
        using the control delete or control insert keys to
        the left of the picture. It can be positioned
        anywhere vertically using the POSition statement.
        Pictures can be moved to another part of a program
        or from one program to another using the RENumber,
        SAVE D: line#, line#, MERGE, and APPEND commands.
5.   Character graphics illustration can be frustrating.
        It is quite possible to get a picture in your mind
        that can't be created with character graphics. A
        different approach is to explore character graphics
        before thinking of specific pictures and just see
        what kinds of images you can come up with. Then
        write a story to go with the images. This approach
        can also help overcome the problems kids have in
        coming up with ideas for madlib stories. The
        creation of illustrated madlib stories with this
        approach is summarized by the following steps:
        a.   Draw a character graphics (or turtle
                graphics) picture.
        b.   Write a little story about it. One or
                two paragraphs is fine.
        c.   At random go through the story and
                underline some of the words.
        d.   For each word make up a question which
                that word might answer. When presented
                as a game this can be a fun activity in
                its own right, especially for campers
                working in small groups.

Book 2   Unit 2

Teaching Tips

        e.   Ask each question with a T: statement.
             Accept the answer with a variable name to
             store the answer.
        f.   Replace each underlined word in the story
             with its corresponding variable name.
             Then tell the story using T: statements.

Some words like articles or adverbs like not don't
work too well and can be avoided in step c. above.
Words that are repeated can be particularly fun,
especially when they are used with more than one
meaning. It's fine for the campers to pick words
at random at first and then develop their own rules
like these.

Cross Reference

    A.   Manuals: PILOT Primer pages 26-30, 67-78, 182-184
                   Student PILOT pages 12-13, 103-105

    B.   Books: A Book of Puzzlements, Herb Kohl

Book 2   Unit 3   Riddles

Estimated Time: 2 sessions

Key Concepts

        The Match statement
        Conditional statements
        Modules and labels
        Numeric variables
        Riddles, clues, and scoring
        Branching stories

Prequisite Statements

        T: A: POS: REN   U:

New Statements

        M: TY: TN: J: JY: JN:
        R: JM: C:#SCORE=#SCORE+1   CY: CN:
        APPEND   MERGE

Materials

        PILOT Book 2 utility disk: RABBIT, RIDDLES, SUGAR,
              INOUT, SPHINX
        Riddle and joke books

Book 2   Unit 3

Activity Outline

1.   Have the campers LOAD and RUN the following
     examples on the utility disk: RABBIT, RIDDLES, and
     SUGAR.

2.   Point out that the way the program responds depends
     on how the person using the program answers the
     riddle.   If the user answers correctly the program
     does one thing while if he answers incorrectly it
     does another.   Explain the use of M: to match what
     the person types with the correct answer and the
     use of TY: and TN: to type responses dependent on
     the outcome of the match.

3.   Have each camper make an illustrated riddle
     program.   Encourage them to use separate modules
     for their illustrations.

4.   As campers finish their riddles use SUGAR to
     introduce them to modules, J:, JY:, and JN:.   Then
     have them add clues to their riddles or write new
     riddles with clues.

5.   Use RIDDLES to show campers how to keep score.
     Then have them write a score keeping program by
     combining two or more riddles using MERGE or APPEND
     and possibly RENumber.

6.   Continue to emphasize use of the POSition statement
     to make the screen look well balanced and easy to
     read.

7.   Have each camper play INOUT and then modify it to
     make up a rule of his or her own.

8.   Have the campers run SPHINX and then start working
     on branching stories of their own.   They can
     continue working on these stories during their free
     time.

Challenges

1.   Add reward sounds and failure sounds to riddles.

2.   Modify madlib stories to reflect differences in
     gender. This is described more fully in challenge
     6 of Unit 2.

3.   Story branches like those in SPHINX can also be
     incorporated in madlib stories.

4.   Use the MS: (match string) statement to explore
     some subtle possibilities for the INOUT game. How
     this can be done is described in the teaching tip
     on INOUT below.

Teaching Tips

1.   Befoe explaining M:, TY:, and TN: it is helpful to
     get the campers to explain to you what happens
     differently when different answers are given to the
     riddle. Then ask them how they would do this to
     arouse their -curiosity and interest about how it
     might be done.

2.   Increasing the value of a variable can be confusing
     so C:#SCORE=#SCORE+1 should not be used to
     introduce the compute statement. Start instead
     with a simpiler assignment statement. First
     discuss what the score should be after the first
     riddle and explain how this is achieved with lines
     60 through 80 in the RIDDLES program.
     Discuss the fact that if the answer to the second
     riddle is correct the score will be one more than
     it was before. Then show how the computer
     calculates this in line 205.

3.   For campers having difficulty with the compute
     statement, conversion programs like this may be
     helpful:
              T:How much do you weigh?
              A:#EARTHWIEGHT
              C:#MOONWEIGHT=#EARTHWEIGHT/6
              T:On the moon you would weigh #MOONWEIGHT.
     Some other ideas for conversion programs are feet
     to inches, degrees fahrenheit to degrees
     centigrade, inches to centimeters, or age now to
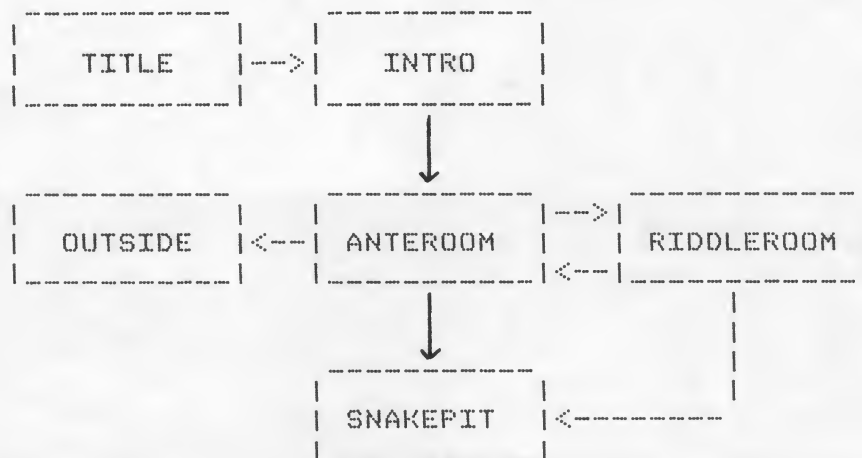   age in the year 2000 or to year of birth.

Teaching Tips

Some of these conversion problems involve decimals.
PILOT works only with whole numbers, but
multiplication and division of decimals can be
handled by representing the decimals as fractions.
For example inches can converted to centimeters
like this:

C:#CENTIMETERS=#INCHES*254/100

since there are 2.54 centimeters in an inch.
Some good ideas for conversion problems (such as
miles to inches) will yield numbers that don't make
sense in PILOT. PILOT works with numbers in the
range -32768 to +32767. Numbers outside this range
'wrap around' into this range. So for example
adding 4 to 32767 will give -32765. As a result
problems that deal with large numbers should be
avoided.
Campers having problems with the compute statement
can also be presented with material in Book 1 Unit
6 activity 2 on using C: to control the size of a
square.

4.   The only new statement introduced in the sphinx
program is the JM: statement in line 410 and it is
fairly easy to understand in this context. The
difficulty in writing a branching story has more to
do with the overall complexity of the program.
Writing branching programs like SPHINX is much
easier if the various possible branches are planned
before the program is written. Before creating
such programs campers should make a simple map or
flow chart like this to show how the program will
be organized.

```
 _____        _____
|              |      |              |
|    TITLE     |-->|  |    INTRO     |
|_____|      |_____|
                             |
                             |
                             v
 _____        _____    _____
|              |      |              |-->|              |
|   OUTSIDE    |<--|  |   ANTEROOM   |   |  RIDDLEROOM  |
|_____|      |_____|<--|_____|
                             |                  |
                             |                  |
                             v                  |
                       _____           |
                      |              |           |
                      |   SNAKEPIT   |<----------
                      |_____|
```

Teaching Tips

Then each box in the map can be filled in as a
separate module. Program organization is also
simplified if pictures are created as separate
modules.

5.   The SPHINX program includes both branches that
      depend on the user's choice (e.g. which tunnel) and
      branches that depend on the performance of the user
      (e.g. correct solution to a riddle.) It also
      demonstrates the repeated use of a branch point
      (e.g. the anteroom.) This makes it more of a cross
      between traditional branching stories and adventure
      games.

6.   The SPHINX program has a couple of shortcomings
      that the campers should be encouraged to ask about.
      The program doesn't keep track of whether you get
      the treasure. As a result you can go back after
      getting the treasure and nothing has changed. Also
      getting outside without the treasure is no
      different from getting there with the treasure.
      How to keep track of the treasure and other items
      in an adventure will be covered in Unit 7. For now
      it is fine for campers to start planning adventures
      in which they would do one thing IF the treasure is
      found and another IF it isn't.
      They may also notice that the sphinx gives them a 5
      second time limit to solve the riddle but doesn't
      enforce this limit. Keeping track of time is an
      important feature in many different games and will
      be covered in Unit 6.

7.   Modifying the INOUT game provides an opportunity to
      study elementary logical operations as well explore
      what makes a puzzle interesting and challenging.
      After modifying the game campers should try each
      other's versions of the game and see which ones
      they like the best. The stated goal in the game is
      to find as many words as you can that are IN the
      group. In fact the real challenge is to figure out
      the rule that defines the group.
      To help you see what some of the possibilities are,
      here is a list of several possible rules along with
      the changes needed to encode the rule in some
      cases. In addition to changing the code in the
      *REPEAT loop campers should be sure to change the
      example in line 60 and the explanation in line 520
      in their own versions of the program.

Book 2 Unit 3

Teaching Tips

Rule	Code changes
Words with Z	260 M:Z
Words without E	270 JN:*IN
	280 JY:*OUT
Words with J or K	260 M:J,K
Words with A and E	260 M:A
	262 JN:*OUT
	264 M:E
Words without A and E	
Words without C or D	
Words with double E	
Words whose letters are all in the first half of the alphabet	
Words beginning with A	260 M: A
Words ending with E	260 M:E ,

(Note: The A: statement automaticly puts a space
at the beginning and at the end of the word that is
entered. If you don't want those spaces use the
AX: statement.)

Words with an E and an A somewhere after the E	260 MS:E
	262 JN:*OUT
	264 A:=$RIGHT
	266 M:A

Words with two Es
Words with only one vowel

The last three rules can not be encoded without the
use of the MS: (match string) statement since the
string must be broken into pieces to make these
checks.

Cross Reference

A.   Manuals   PILOT Primer pages 41-65, 76-77, 81-82
                 Student PILOT pages 14-20, 26-30, 95-97,
                    101-102

B.   Books   A Book of Puzzlements, Herb Kohl

C.   Other Units   Unit 7 - timed input, passing
                     information from one module to
                     another

Book 2 Unit 4   Number Games

Estimated Time: 2 sessions

Key Concepts

     Numeric variables
     General conditional statements
     Counting loops

Prerequisite statements

     T: TY: TN: A: C: M:
     J: JY: JN: E: R:

New Statements

     T(...):   J(...):

Materials

     PILOT Book 2 utility disk: NUMPATRN, STRGUESS, HURKLE,
          SEQUENCE
     Number sequences worksheet

Book 2   Unit 4

Activity Outline

1.   Introduce general conditional statements by writing
     a number guessing game with the whole class.

2.   Have each camper create his or her own version of a
     number guessing game. Then have them try each
     others games.

3.   Have the campers run NUMPATRN, STRGUESS, and
     HURKLE, and then make up their own variations on
     these. These variations should include at least
     one of the challenges suggested below.

4.   Give each camper the number sequence worksheet.

5.   With the group as a whole write a program to count
     from 1 to 10. Then get the group to figure out how
     to modify it to count by twos (i.e. even numbers).

6.   Have the campers write their own programs to print
     some of the number sequences on the number sequence
     worksheet.

7.   Have each camper use a counting loop in some other
     program. Some suggestions for possible programs
     are listed in tip 6 below.

8.   Have each camper run SEQUENCE and then write his or
     her own sequence program to do one or more harder
     sequences.

Challenges

1. Modify the number guessing program to give the clue
    'much more' or 'much less' if the guess is more
    than 10 away from the secret number.

2. Add other clues to the number guessing program such
    as 'the number is even', or 'the number is not
    divisible by three.' Print each of these clues
    just once.

3. Make the number guessing program or NUMPATRN,
    STRGUESS, or HURKLE give the user a score based on
    the number of guesses made before getting the right
    answer. Limit the number of guesses allowed.
    Limit the number of rounds in the INOUT game.

4. Modify one of these games to give clues using sound
    rather than text. The pitch and duration of the
    sound could be used to indicate how close you were
    or which direction you needed to go.

5. Add a second target number in NUMPATRN, i.e. after
    getting a 7 as output the user should be
    congratulated and asked to try to get 19 as output
    and after getting 19 the game would be over.

6. Use a counting loop to play patterned musical
    phrases. For example a sequence of notes going up
    one at a time (i.e. a chromatic scale or a glis) or
    alternating back and forth between two notes (a
    trill). More complex patterns such as 1,2,3,2,3,4,
    3,4,5,... are also interesting to explore. Any
    numeric pattern will have a corresponding musical
    one.

7. Change line 30 in STRGUESS so that it only is
    printed after the first guess. Experiment with the
    clues given here. In particular try modifying line
    64.

8. Change the HURKLE program to work with a vertical
    number line rather than a horizontal one.

9. Make a two dimensional version of HURKLE where you
    would have to detemine both the vertical and the
    horizontal position of the hurkle.

Book 2   Unit 4

Challenges

10. Explore the relationship between NUMPATRN and
    number sequences by studying the =sequence that
    comes out when you put in 1 and then 2 and then 3,
    etc. With the current rule this will generate the
    sequence 3, 4, 4, 5, 5, ... Changing line 40 to
    C:#OUT=#IN*2-1 will change the sequence to 1, 3, 5,
    7, 9, ..., the first sequence on the worksheet.
    More complicated sequences can be generated by
    using a different sequence as input in NUMPATRN.
    For example, using 2, 5, 8, 11, 14, ... as input
    for the current rule gives output of 4, 5, 7, 8,
    10, ...

11. Write a program that will try to guess the user's
    secret number given clues of more or less. Try to
    make the program able to guess as quickly as a
    person can.

12. Write programs to print the last four sequences on
    the number sequence worksheet.

13. Write a program to play '23 matches' or 'NIM'.
    In 23 matches the computer prints several match
    sticks on the screen. Two players take turns
    picking up matches. On each turn a player can take
    1 to 3 matches. In NIM the computer draws several
    piles of matches on the screen. On his turn a
    player can take as many matches as he wants from
    any one pile. In both games the player taking the
    last match wins. The computer can manage a game
    between two opponents or it can be one of the
    players.

Teaching Tips

1.   As a whole have the class write a "riddle" program
      for this riddle: Question: What is my secret
      number? Answer: 23. It will look something like
      this:

```
100 T:WHAT IS MY SECRET NUMBER?
110 A:
120 M:23
130 TY:RIGHT!
140 TN:NO, 23.
```

Then ask what clues should be given if the answer
is wrong. The campers may have several
suggestions. These should be encouraged and may
lead the campers to developing new interesting
programs. We are particularly interested in the
clues like: "it's more than that," or "it's less
than your guess." These are fairly natural clues
for this game and provide a fairly natural way to
introduce numeric conditionals.
After elliciting several clues you can show how to
program the more and less clues. To do this we
need to keep track of the guess so we can compare
it to the secret number. So we change line 110 to
110 A:#GUESS. Then we can replace line 140 with:

```
140 T(23>#GUESS):NO, MORE THAN THAT.
150 T(23<#GUESS):NO, IT'S LESS THAN #GUESS.
```

We are now ready to repeat the question. In our
previous riddles with clues (e.g. SUGAR) we would
type the question again and then give another clue.
Here we will give the same clues, so we can jump
back to the question like this:

```
90 *QUESTION
160 J(23<>#GUESS):*QUESTION
```

The jump is conditional since we don't want to
repeat the question if the answer is right.

2.   In creating their own versions of a number guessing
      game or NUMPATRN, STRGUESS, or HURKLE, campers
      should put in their own target number and any other
      clues that might be helpful. If the number is
      fairly large one good clue is to provide a range
      that the number is in. If this idea comes up it is
      worth spending some time discussing it since it
      will come up again in the next unit on randomness.
      In working with large numbers the campers may
      discover that PILOT only works with whole numbers
      in the range from -32768 to +32767. It is fine for
      them to play around with this as long it doesn't
      confuse them about how the number guessing program
      itself works.

Book 2   Unit 4

Teaching Tips

3.   In exploring NUMPATRN encourage the campers to try
     changing the calculation in line 40 as well as
     changing the target in lines 52 and 70.

4.   Encourage campers to figure out the meaning of the
     clue in STRGUESS. If there is one star you are one
     away. If there are 2 stars you are 2 or 3 away.
     If there are 3 stars you are 4 to 7 away. If there
     are four stars you are 8 to 15 away. Each time you
     double your distance from the target you will get
     one more star in the clue.

5.   In writing a program to count from 1 to 10 it may
     be easiest to start by writing an infinite counting
     loop:
                    10 C:#NUMBER=1
                    20 *REPEAT
                    30   T:#NUMBER
                    40   C:#NUMBER=#NUMBER+1
                    50   J:*REPEAT
     and then putting a limit in line 50:
                    50   J(#NUMBER<11):*REPEAT

6.   Counting loops have a wide range of applications.
     They can be used to print your name 10 times,
     countdown for a blastoff, print a fixed number of
     stars, limit the number of guesses you allow in a
     riddle or number guessing game, draw a fixed number
     of nested boxes or a spiral pattern of a fixed
     size, or play a sequence of musical notes as
     suggested in challenge 6 above. If you write a
     module to print a variable number of stars then you
     can use it in another counting loop to print
     patterns like these:
          *   *   *
          **   ***   * *
          ***   *****   * * *
          ****   *******   * * * *

7.   It isn't necessary for the campers to finish the
     number sequence worksheet. If they get stuck on an
     early sequence, have them tell you how much it
     changes from one number to the next and write these
     increases as another sequence below the one in
     question. Then have them look for patterns in the
     increases. The purpose of this exercise and the
     SEQUENCE program is to give the campers some
     experience in looking for patterns and to see how
     variables can be used to control such patterns.

NUMBER SEQUENCES

Each of these sequences follows a pattern.

Complete each of the sequences.

Then describe the pattern under the sequence.

1,   3,   5,   7,   9,   ___,   ___,   ___

2,   5,   8,   11,   14,   ___,   ___,   ___

5,   12,   19,   26,   33,   ___,   ___,   ___

2,   3,   5,   6,   8,   ___,   ___,   ___

5,   9,   16,   20,   27,   31,   ___,   ___,   ___

1,   3,   6,   10,   15,   21,   ___,   ___,   ___

1,   4,   9,   16,   25,   36,   ___,   ___,   ___

3,   5,   10,   18,   29,   43,   ___,   ___,   ___

1,   6,   14,   26,   41,   60,   ___,   ___,   ___

2,   3,   5,   8,   13,   21,   ___,   ___,   ___

1,   3,   7,   15,   31,   63,   ___,   ___,   ___

5,   7,   10,   20,   43,   85,   ___,   ___,   ___

Answer sheet.

1,   3,   5,   7,   9,   11,   13,   15

Odd numbers.   Increasing by 2 each time.

2,   5,   8,   11,   14,   17,   20,   23

Increasing by 3 each time.

5,   12,   19,   26,   33,   40,   47,   54

Increasing by 7 each time.

2,   3,   5,   6,   8,   9,   11,   12

Increasing by 1 and then by 2 and then by 1, etc.

5,   9,   16,   20,   27,   31,   38,   42,   49
   4   7   4   7   4   7   4   7
Increasing by 4 and then by 7 and then by 4, etc.

1,   3,   6,   10,   15,   21,   28,   36,   45
   2   3   4   5   6   7   8   9
Increasing by 2 and then by 3 and then by 4, etc.

1,   4,   9,   16,   25,   36,   49,   64,   81
   3   5   7   9   11   13   15   17
Increasing by 3 and then by 5 and then by 7, etc.
Square numbers
3,   5,   10,   18,   29,   43,   60,   80,   103
   2   5   8   11   14   17   20   23
Increases equal the second sequence on this sheet.

1,   6,   14,   26,   41,   60,   82,   108,   137
   5   8   12   15   19   22   26   29   .
   3   4   3   4   3   4   3

2,   3,   5,   8,   13,   21,   34,   55,   89
   1   2   3   5   8   13   21   34
Increases are just like the sequence itself.

1,   3,   7,   15,   31,   63,   127,   255,   511
   2   4   8   16   32   64   128   256
Keep doubling the increases or
to get the next number multiply by 2 and add 1.
5,   7,   10,   20,   43,   85,   152,   250,   385
   2   3   10   23   42   67   98   135
    1   7   13   19   25   31   37
     6   6   6   6   6   6

Book 2   Unit 5   Randomness

Estimated Time: 2 Sessions

Key Concepts

        Randomness and random numbers
        Generating random numbers within a defined range
        Random story elements, sounds, duration of time, colors,
            designs, sizes of figures and screen placement
        Simulating chance events using computer-generated random
            numbers

Prerequisite Statements

        C:#R   T: A:
        U: J: E:

New Statements

        C:#RANDOM=?
        C:#RANDOM=?\#B
        C:#RANDOM=?\(#B-#A+1)+#A

Materials Required:

        PILOT Cartridge
        Book 2 Utility Disk: RNDNUM, RNDWALK, RNDSTORY,
            RNDTUNES, LETTERS

                    .

Activity Outline

1.   Explain the idea of random numbers and their
     implementation in PILOT. Emphasize the following
     points:
     a.   Fishbowl analogy (P. 21 of Student PILOT
          Reference Guide).
     b.   Range of numbers generated (-32768 to
          +32767).
     c.   Assignment of random numbers to a numeric
          variable using a C:#RANDOM=? command.

2.   RUN program RNDNUM; press the BREAK key to stop it.

3.   Explain that usually it is more useful to generate
     random numbers within a smaller defined range,
     especially when simulating chance events (e.g.
     flipping coins or rolling dice). Have students
     suggest and discuss the appropriate range of random
     numbers for each of the following:
     a.   Flipping a coin (0-1 or 1-2).
     b.   Rolling a six-sided die (1-6).
     c.   Rolling a 12-sided die (1-12).
     d.   Picking a card from a standard deck--no
          jokers (1-52).
     e.   Throwing darts--20 pie-shaped wedges (1-20).
     f.   Generating a "hit percentage" in a Fantasy
          Games like Dungeons & Dragons
          (0-99 or 1-100).
     g.   Generating a tone in PILOT (0-31).
     h.   Generating a random angle for the turtle to
          turn (0-359 or 1-360).
     i.   Generating a random distance for the turtle
          to move (0-whatever limit you want).
     j.   Generating a random X-coordinate
          (horizontal) on the PILOT text screen
          (0 to 39) or graphics screen (-79 to 79).
     k.   Generating a random Y-coordinate (vertical)
          on the PILOT text screen (0 to 23) or
          graphics screen (-31 to 47).

4.   Introduce the modulo operator in PILOT in terms of
     its use for generating random numbers between 0 and
     a given upper limit (C:#RANDOM=?\limit). Have
     campers modify the RNDNUM program so that it
     generates numbers for some of the ranges suggested
     in points a-i above. (Omit the partially negative
     ranges j and k for now.)
     Note the general form for generating random numbers
     greater than or equal to zero and less than some
     upper limit, B: C:#RANDOM=?\#B.

5. Show how to randomly select a word from several
   possibilities. Then have the campers include some
   randomness in one of their previous programs.
   Possibilities for this include random selection of
   words, phrases, sentences, or paragraphs in a madlib
   or branching story, random selection of a riddle
   from a list of several riddles, and random range and
   target selection for a number guessing game.

Challenges

1.   After adding a random target to a number guessing
     game ask the player if he would like to play again.
     Keep and display an accumulated score and an
     average number of guesses required. Make the range
     depend on how well the player does.

2.   Make success in NUMPATRN depend on hitting two
     randomly chosen targets in a row. This is an
     extension of challenge number 5 in Unit 4. Here
     however the targets are chosen at random and if the
     player doesn't get the second target right away a
     third target can be chosen and play can continue
     until two targets are achieved in a row. After
     winning a new rule could be chosen at random for
     another round of the game.

3.   Show the campers RNDSTORY and have them make up
     random sentence builders of their own. The
     vocabulary in RNDSTORY can be changed and expanded,
     but the campers will notice that all the sentences
     are of the same form. This should lead them to
     explore other sentence structures and styles of
     writing. The content of the sentences will still
     be meaningless, but the rythum of it may begin to
     flow better. To try to approach some sembelance of
     meaning it may be easier to start with a madlib
     story and make most of the text random, keeping the
     sentence structure intact and reusing words that
     are repeated in the original story. What is
     created this way won't be literature, but may draw
     the camper's attention to many interesting aspects
     of writing structure and style.
     Random attempts at poetry can be approached by
     choosing randomly from among words or phrases that
     rhyme or have the same number of syallables and the
     same emphasis.

4.   Random Tones.
     Have campers write a program that generates an
     unending series of random tones using the C:, SO:,
     FA:, and J: commands. Each tone should be played
     for a constant duration (e.g. 1/2 second = 30/60
     second = FA:30).
     Have campers modify their programs to generate one
     tone for random durations (it will sound something
     like Morse code). Then have them combine random
     tones and durations (ear plugs anyone?).

Challenges

Random sounds can be more pleasant to listen to if
the range of notes is restricted in various ways.
The RNDTUNES program allows campers to listen to
notes chosen at random from a list of notes they
enter. The musical effect depends on the harmonic
relationships between the notes in the list.
Compare the differences in mood that the following
lists evoke:

        13, 17, 20, 25
        13, 17, 18, 20, 23, 25
        13, 15, 18, 20, 22, 25
        13, 14, 21, 22, 23, 24
        13, 14, 15, 16, 17, 18, 19, 20

While the programming in the RNDTUNES program is
fairly complicated (involving lists and arrays,)
campers can include random music of this sort in
their programs by selecting notes in the same way
random words are selected in RNDSTORY. An example
of this is given in Tip number 4 below. The
RNDTUNES program can help them decide what set of
notes to select from.

5.   Random Turtle Walk. (For campers familar with
     turtle graphics.)
     Have campers LOAD and examine RNDWALK. Before they
     RUN it, have them predict what it will do.
     Propose the idea that you might want to limit the
     turning angle to the narrow range of 45-60 degrees
     inclusive instead of 0-359 degrees as the program
     now stands. Encourage campers to determine how to
     generate random numbers in the range 45-60 and help
     them to generalize to the formula
     C:#RANDOM=?\(#B-#A+1)+#A for generating random
     numbers in the range A through B inclusive.
     Have campers modify the RNDWALK program so that
     both the length of the turtle's step and the
     turning angle are chosen at random within specified
     ranges. Modify the program to use DRAW (in place
     of GO) causing the turtle to trace out a complete
     path on the screen.

Book 2   Unit 5

Challenges

6.   Games of Chance.
     Knowing how to generate random numbers opens up the
     possibility of writing a variety of programs to
     play games of chance. The simplest games involve
     flipping a coin and printing whether it is heads or
     tails. Before printing the results the player can
     be asked to place a bet on what the results will
     be. The program can keep track of the bets and
     appropriate payoffs. The results can be graphed
     like a random walk. More interesting games can be
     created by soliciting bets on whether 10 heads will
     come up before 10 tails and allowing new bets after
     each toss. This can easily be changed into a race
     between two horses. More horses can be added by
     increasing the range of the random number choice.
     Horses can be displayed as dots on the graphics
     screen. Handicapping can be achieved by moving
     each horse forward an amount corresponding to its
     handicap each time its number comes up at random.
     This brings up more aspects of probability in
     determining appropriate odds. Other aspects of
     probability are encountered in rolling dice.
     Campers can explore the effects of rolling dice of
     different sizes and see what effect it has if they
     multiply rather than add the results.

7.   Advanced campers who understand the lists and
     arrays used in the RNDTUNES program and LETTERS
     program from Unit 2 might be interested in trying
     to put a list of items in a random order. This
     application is useful for such functions as
     shuffling a deck of cards. If a camper starts with
     the LETTERS program and modifies it to put the
     letters of a word in random order it can be used to
     create an anagram game.
     An interesting type of music can be created by
     randomizing the 12 notes in the chromatic scale
     (notes 13 through 24 in PILOT) and then playing
     them. After each note has been played once the
     process is repeated with a new random ordering.

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Teaching Tips

1. Pages 21 and 22 of the Student PILOT Reference
    Guide may help you explain the idea of random
    numbers and the use of the modulo operator (\) to
    limit the range of numbers generated.

2. If students ask how the computer generates random
    numbers, just say that it's a complicated process,
    but that there is a register in the computer's
    memory whose value is constantly changing. When
    you ask for a random number, the computer takes
    whatever value happens to be in that register.

3. Explain the modulo operator functionally--how to
    use it to limit the range rather than explaining
    the theory behind it (modulo is the remainder after
    division by a given number...)

4. Campers should be able to figure out for themselves
    how to select words at random. Before explaining
    it to them give them a chance to explain it to you.
    Say that you want to randomly choose between DOG,
    CAT, and MOUSE and ask for suggestions as to how to
    do it. With a little encouragement they should see
    that the range is 3 since there are 3 words. So we
    start by picking a random number mod 3 -
    C:#RANDOM=?\3. Then we let each word correspond to
    one of the numbers with a statement like
    C(#RANDOM=0):$WORD=DOG or T(#RANDOM=1):CAT.
    Phrases, sentences, or whole paragraphs can depend
    on such a random choice.
    Random music can be generated in a similar way:

```
        C:#COUNTER=1
        *PLAYNOTE
                C:#RND=?\4
                SO(#RND=0):13
                SO(#RND=1):17
                SO(#RND=2):20
                SO(#RND=3):25
                PA:5
                C:#COUNTER=#COUNTER+1
            J(#COUNTER<17):*PLAYNOTE
```

    Both of these examples involve the use of a table
    of words or notes that correspond to a list of
    numbers. Tables are useful structures with a wide
    range of applications in computer science.

Book 2   Unit 5

Teaching Tips

5.   Be sure students have had time to become
     comfortable generating random numbers between 0 and
     some upper limit before generalizing to numbers
     between any lower limit and any upper limit.

6.   In explaining how to generate a random number
     between any lower and upper limits, note that first
     you must determine the width of the range and then
     you offset the range from 0 by adding (or
     subtracting) the number where the range begins.
     That is, in generating numbers from 5 through 10,
     the width of the range is 6 and the range starts at
     5.   So the PILOT command would be C:#R=?\(10-5+1)+5
     or more simply, C:#R=?\(6)+5.

Cross Reference

     Student PILOT Reference Guide, Pp. 21-23. Also, the
          following examples in the Student PILOT all make
          use of random numbers:
                    P. 49, Fig. 3-20
                    p. 50, Figs. 3-21 and 3-22
                    P. 63, Fig. 4-10
                    P. 65, Fig. 4-12
                    P. 73, Fig. 4-20
                    P. 79, Fig. 4-25
                    P. 88, Fig. 5-5
                    P. 90, Fig. 5-7

     The PILOT Primer, Chapter 7, P. 109, Pp. 122-123
     ATARI Games and Recreations by Kohl, Kahn & Lindsay
     ATARI Sound and Graphics by Moore, Lower & Albrecht,
          Chapter 8

Book 2   Unit 6   Animation

Estimated Time: 3 sessions

Key Concepts

    Animation

Prequisites

    T: POS: U: J: C:
    A: M: R: E:
    General conditional statements

New Statements

    T:...↓←←...   POS:#OVER,#DOWN   PA:
    Turtle graphics commands

Materials

    PILOT Book 2 Utility disk: ALPHA, LUNCHEON, BIRD,
        JINGLE, SPHINX, ARROW, ROCKET, JUMPER, FLY, DRIVE,
        BALLOON, INCIDENT, FLYER
    The Animation Book, Kit Laybourne, Crown Publishers,
        New York 1979
    Computer Animation Primer, David Fox and Mitchell Waite

Activity Outline

1.   Use the ALPHA program to introduce campers to the
      placement of pictures in arbitrary places on the
      screen and the use of arrow keys in Type
      statements.

2.   Have the campers RUN LUNCHEON and BIRD to see
      some uses of static animation. Then have them
      create some similar pictures of their own.

3.   Have the campers modify their programs or LUNCHEON
      or BIRD to allow the user to position the picture.
      It should start by asking where the picture should
      be printed and then print it there.

4.   Once this is working have them modify the program
      further to ask the user if she would like to
      reposition the picture and then reposition it
      accordingly. This option should continue until she
      is happy with where the picture is. Then the
      static animation can take place.

5.   Now we are ready to try animation with motion. Use
      the ARROW and ROCKET programs to demonstrate how
      this can be done. In particular discuss the *FLY
      module in lines 230 to 270 of the ARROW program.
      Have campers each create a small character graphic
      image and then move it across or up or down the
      screen in the same fashion.

6.   Discuss the incorporation of animation in larger
      programs and the design of projects. Emphasize the
      division of projects into smaller pieces that can
      be handled with distinct program modules.

7.   Review turtle graphics. Point out how the turtle
      can be used as an animated character by running
      JUMPER. Demonstrate the robot turtle.

8.   Use the programs DRIVE and FLY to demonstrate
      simple animation in turtle graphics. Have the
      campers work on projects or create more animated
      pictures of their own in turtle or character
      graphics.

Chal

dd some animation to a previous program. This
ight include animation in a branching or madlib
tory like INCIDENT, a riddle like RABBIT plus the
nimation in LUNCHEON, or a number game like
ALLOON. For example, the NUMPATRN game could be
nhanced by displaying a machine on the screen and
aving the #IN number appear to go into the machine
nd be transformed into the #OUT number while gears
pin, pistons pump, bells ring, whistles blow, and
ights blink.

n programs where the user can control placement of
 picture by entering the coordinates where it
hould drawn, the program should check what the
ser types in to make sure the picture isn't placed
ff the screen. Where it is safe to draw the
icture will depend on how big it is. The program
hould check the input and print an appropriate
rror message if it is out of range.

ombine static shape change animation with motion.
his can be done by moving the figure each time a
ersion of the figure is drawn. It is generally
asier to move it once each time the whole sequence
f figures is drawn. For example, in the BIRD
rogram the bird could be moved by making the
ollowing changes:

```
        80  C:#DOWN=22
       100  POS:5,#DOWN
       102  C:#DOWN=#DOWN-1
       120  J(#DOWN>0):*AGAIN
```

ice this has been done it might be fun to make a
mple cartoon where the bird would fly across the
reen and then put down feet, land somewhere, and
ld up its wings.
other idea for a combination of motion and change
 shape would be to add changing flames and maybe
cloud of smoke to the ROCKET program. The
nning child in INCIDENT is another example of
mbining motion with a change in shape.

imate a figure in two dimensions. This requires
dating both the variable for how far over and the
e for how far down the figure is each time the
gures are redrawn. If a figure moves more than
e square at a time in any direction, the figure
ll need to be erased and then reprinted.

Book 2   Unit 6

Challenges

Interesting paths of motion can be created by
moving a figure one square at a time in one
direction and moving it according to the numbers in
a number sequence in the other direction. The
effect of this kind of motion may be easier to see
if it is done in turtle graphics where there is
more room. FLYER shows an example of this kind of
animation. In effect this kind of motion will be
the graph of the number sequence.

5.   Try animating two or more images at once. This
      involves creating one loop in which each image is
      updated.

6.   Campers familiar with turtle graphics may want to
      persue animation there. One challenge is to modify
      the FLY program to make the bird move as it flies.
      FLYER shows one way to do this.
      Another challenge is to try using PEN ERASE and
      drawing over the figure instead of using CLEAR
      which clears the whole screen. This makes possible
      animation with other figures on the screen.
      Interesting designs can also be created by leaving
      out the CLEAR or PEN ERASE statements and leaving
      figures on the screen as the turtle moves on.

7.   Write a program for the robot turtle to feel its
      way through a maze. Write a program for the robot
      turtle to take a random walk until it runs into a
      box and then push the box randomly around the
      floor. Try to modify this program to push the box
      in one general direction.

Teaching Tips

1.   Have the campers explore and then modify the ALPHA
      program as follows: RUN the program. Then LIST
      200 to 290 and change the POSition statements to
      put the letters in different places. They might
      try to spell another word like hall or lap or they
      might just put the letters anywhere. Once it is
      clear how simple it is to make these changes by
      just changing the POSition statement have them
      design a screen using the letters of their names or
      some other word that requires more letters than a,
      h, l, and p. To do this they should LIST 500 to
      660 to see how a couple of the letters were
      created.

Teaching Tips

It may be necessary here to explain the function of
the arrow keys in the Type statement. They are
entered by pressing ESC and then the desired arrow
key with CTRL. PILOT then makes them part of that
Type statement. When it follows that statement it
moves the cursor accordingly rather than printing
the arrow. Using this you can move the cursor to
any place on the screen relative to where the
statement started typing. In the case of these
pictures we move the cursor to the beginning of the
next line of the picture so that we are ready for
the next type statement. A slightly different
approach is used to print the smoke in the INCIDENT
program.
It is possible to have your program print arrows
when it runs. This is achieved by embedding an ESC
character before each arrow in the Type statement.
To enter this you must press ESC twice to put ESC
in the statement and then press ESC and then CTRL
and your arrow to put your arrow in the statement.
This is demonstrated in the anteroom picture in the
SPHINX program.
Use of arrow keys to create pictures that can be
placed anywhere on the screen is helpful even if
animation is not anticipated since it makes it so
easy to adjust the position of the picture on the
screen when trying to make the output pleasant to
look at.

2.   The placement of pictures on the screen can be
      covered a lot earlier if the opportunity arises.
      Challenge number 5 in Unit 2 introduces this
      concept and as pointed out above it can be useful
      when laying out a screen to have pictures that can
      be placed anywhere.

Book 2   Unit 6

Teaching Tips

3.   Other examples of static animation can be found in
      JINGLE, SPHINX, and the clicking heels in INCIDENT.
      If campers have trouble coming up with ideas of
      their own for static animation, here are a few
      suggestions that might interest them:

                    Faces with mouths that open for words to
                         come out
                    Noses that twitch
                    Eyes that blink
                    Ears that wiggle
                    Animals with swishing tails
                    Wheels that spin
                    Flames for a fire
                    A kicking mule
                    A balloon that expands

      They might also like to consider pictures of things
      that they might like to move later like animals,
      boats, trains, spaceships, or a faucet or ice cream
      cone that drips. In any case the pictures they
      create should be made in modules with CTRL arrows
      in the Type statements so that they can be used
      repeatedly in different places on the screen.

4.   In activity 3 the question about where the picture
      should appear on the screen should be split into
      two parts, one asking how far over the picture
      should be and the other asking how high. The
      variables used to store the answers to these
      questions can then be used in a POSition statement
      to place the picture. If the entered position is
      near or off the edge the picture will not come out
      right. As suggested in Challenge 2 the program can
      be modified to watch out for this. However, for
      present purposes it is only necessary that the
      picture can be placed in several places toward the
      middle or left of the screen. For campers who are
      having problems, rather than confusing the issue
      with numbers that might be too near the edge have
      them restrict their input to numbers from 2 to 15.

Book 2   Unit 6

Teaching Tips

5.   The simplest way to move a picture to a different
      place on the screen is to erase it and then draw it
      again in the new position. To erase a picture a
      module should be created with statements like this:
      T: ↓←←←←\. The length of each statement should
      correspond to the width of the picture to be erased
      and the number of such statements should correspond
      to the height of the picture. Then the picture can
      be erased by positioning the cursor in the same
      place it was positioned to draw the picture and
      using the erase module.

6.   Once a program is written that allows the user to
      move a picture around the screen it is a simple
      matter to have the program control where the
      picture should move to. Having the program control
      the motion, however, can be harder to understand
      and debug. For this reason it is important for the
      campers to write and understand programs where the
      user directs where the picture shall be moved to
      before attempting program controlled motion.

7.   If campers have trouble understanding the animation
      control loop in ARROW or ROCKET, have them move the
      rocket without using a loop. This can be done with
      a sequence of statements of the form
                    POS:25,14
                    U:*ROCKET
                    POS:25,13
                    U:*ROCKET
                    POS:25,12
                      ...
      and in fact corresponds to the positions determined
      by the loop.

8.   Both the ARROW and ROCKET programs move their
      images without using a separate module to erase the
      image before redrawing it. Instead they print
      right on top of the previous image and print a few
      extra spaces (on the left of the arrow and below
      the rocket) to erase the part of the previous image
      that would otherwise still be showing. This
      technique can be used whenever the picture is only
      being moved one space at a time. It makes the
      animation move more quickly and smoothly since less
      characters need to be printed each time the picture
      is moved.

Teaching Tips

9. Larger pictures are harder to animate because the
    time it takes for all the characters in the picture
    to be printed is long enough for you to see the
    incomplete picture on the screen. They also can
    not be placed as near the edge of the screen. For
    these reasons encourage the campers to work with
    smaller figures to start with. As they gain
    experience they can develop their own guidelines as
    to how big a picture they can animate successfully.

10. Pictures can not be placed near the right edge of
    the screen because PILOT will treat the CTRL arrows
    in the Type statements as words. If a word is too
    long to fit on a line PILOT moves the cursor to the
    beginning of the next line. This problem can be
    reduced by placing a space and an extra back arrow
    after each arrow. This fools PILOT into
    interpreting the arrows as several smaller words so
    that it stays on the same line. However, it makes
    the listing of the picture harder to understand.

11. With this type of character animation it is hard to
    display images moving on and off the screen. To
    move pictures gradually off the screen separate
    pictures must be made for each partial image. It
    is much easier to move images on and off the screen
    using turtle graphics.

    Cross Reference

        PILOT PRIMER pages 182 to 184

Book 2 Unit 7   Interactive Programming

Estimated Time: 2 sessions

Key Concepts

        Control of animation from the keyboard or joystick
        Joystick control of the turtle
        Timing of input
        Passing information from one module to another
        Large projects

Prerequisites

        T: POS: U: J: C:
        A: M: E: R:
        General conditional statements
        Turtle graphics commands

New Statements

        JM: AK: %J0   %T8
        %X   %Y   %ST

Materials

        PILOT Book 2 Utility disk: KEYSHIP, STIKSHIP, KEYDRAW,
            SPHINX, SAPHIRE, CATCHIT

Activity Outline

> By the time this unit is started the campers should be
> working on projects. Activities in this unit are
> intended to introduce campers to aspects of interaction
> that can be useful in real time interactive programming.
> Concepts of program organization and the management of
> information within programs are also covered. Before
> starting these activities it may be helpful to review
> program organization as discussed for the SPHINX program
> in tip 4 of Unit 3.

> 1.   Use KEYSHIP and STIKSHIP to introduce the use of
>   the keyboard and the joystick to control animation.
>   Have campers modify one of their programs from Unit
>   6 to allow the user to position a picture in this
>   way.

> 2.   Use KEYDRAW to show how this kind of interaction is
>   easily adaptible to other types of programs. Have
>   campers modify KEYDRAW or STIKSHIP to create a
>   "STIKDRAW" program.

> 3.   Use the SAPHIRE program to show how the joystick
>   can be used to control the turtle. Pay particular
>   attention to lines 300 to 390 and 90 to 200.
>   Campers may be interested in modifying these parts
>   of the program to control the turtle with the arrow
>   keys instead of the joystick or to make the turtle
>   continue to move once it is set in motion in some
>   direction.

> 4.   Use the following routine to show how a timelimit
>   can be added to the input in the SPHINX program:

```
2000 *TIMEDINPUT
2010   C:#TIMELEFT=#TIMELIMIT
2020   C:$ANSWER=
2100   *INPUT
2110     C:$LETTER=
2120     AK(%K):$LETTER
2130     T:$LETTER\
2140     C:#TIMELEFT=#TIMELEFT-1
2150     C:$ANSWER=$ANSWER$LETTER
2160   J(#TIMELEFT>0):*INPUT
2170   A:=$ANSWER
2180 E:
```

Activity Outline

> To use this with the sphinx program, we only need
> to add these two lines:
>> 788 C:#TIMELIMIT=80
>> 790 U:*TIMEDINPUT
>
> Have the campers incorporate the same routine in
> their own programs where they want to limit the
> input time.

5.   Have the campers run CATCHIT as an example of other
     applications where input is monitered for a limited
     period of time. Some campers may want to include
     similar applications in their programs.

6.   In CATCHIT point out the use of #TOOSOON and #GOTIT
     as binary state variables with a value of either
     #TRUE or #FALSE as a way to keep track of things
     that happen in one routine and affect events in
     another routine. Have the campers find similar
     variables in SAPHIRE. Point out how careful naming
     of these variables makes the program listing easier
     to read and understand.

Challenges

1.   Combine aspects of the STIKSHIP and BIRD programs
     to create a program where the bird flies around the
     screen under control of the joystick. Make the
     bird put down its feet and fold up its wings when
     the joystick trigger (%T8) is pressed.

2.   Modify the KEYSHIP, STIKSHIP, or KEYDRAW program to
     keep it from crashing when it goes off the screen.

3.   Modify control of the turtle in SAPHIRE or your own
     program so that the turtle moves faster when you
     push the joystick towards the top, slower when you
     pull it toward the bottom, and turns a few degrees
     to the left or right when the joystick is pushed to
     the left or the right. Alternatively make the up
     arrow move the turtle forward, the down arrow move
     it back, the left arrow turn it left 10 degrees,
     and the right arrow turn it right 10 degrees.

4.   The #TIMELIMIT in the *TIMEDINPUT routine counts
     how many times the program should go through the
     *INPUT loop. The routine could be improved by
     making the units in the time limit more meaningful
     to a human being like seconds. To do this line
     2010 whould have to be changed to convert the
     number of seconds to the appropriate number of
     passes through the *INPUT loop. Try it.
     The input in this routine does not end if you press
     return since you can't make the Match statement
     catch return. However, if this is important in
     some application the user could be prompted to
     terminated the input with another key such as the
     space bar or a CTRL character. Once this is done
     the amount of time actually taken to answer the
     question is easy to calculate. Try writing a
     trivia quiz show or math drill program where the
     user will get a better score if she answers the
     questions faster.

5.   Using the AK(%K): statement for input write an
     encoding/decoding program to take letters as they
     are typed in and print them out in code. Modify
     this program to make a Morse code generater that
     will watch the keyboard and beep appropriate Morse
     code for any letters that are pressed.
     Turn the keyboard into a musical keyboard, playing
     different notes for each key typed. Store the
     notes in a string and use the routines in RNDTUNES
     to take the string apart and play back the notes
     later.

Challenges

6. APPEND several riddles or jokes together and tell
them at random. Use a true/false variable with
each riddle to keep track of whether or not it has
been told or not so you don't tell the same riddle
twice.

Teaching Tips

1. In activity 1 the user of the program needs some
way to indicate that he is done moving the picture
around. Rather than constantly asking whether he
is done the program should prompt him to press the
joystick trigger (%T8) or RETURN when he is done.
Then each time the program checks the position of
the joystick it should also check the trigger. As
the campers finish this activity discuss the
differences between this method of placing a
picture on the screen and the one used in Unit 6
where coordinates were entered.

2. You will notice in using KEYSHIP and STIKSHIP that
if you move the ship too near the bottom of the
screen part of it will wrap around to the top of
the screen. This is because of the way the arrow
keys are interpreted. The same problem occurs when
the ship is moved close to the right edge. Here
however the ship is interpreted as a word and moved
around to column 2 on the next line while the
spaces that are intended to erase it do not form a
word so they don't wrap around until they get to
the end of the line. As a result the ship is not
completely erased when it wraps around like this.
The simplest way to avoid this is not to draw the
ship near the right edge in the first place.

3. The *TIMEDINPUT routine can be a little confusing.
There are two things occuring in it: timing and
string input. The timing is handled by reducing
the TIMELEFT every time through the *INPUT loop and
continuing to go through the loop as long the
TIMELEFT is positive. The rest of the routine is
used to assemble the input string. We start out in
line 2020 with nothing typed in. In the *INPUT
loop %K tells us whether a letter has been pressed.

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Teaching Tips

If a letter has been pressed line 2120 accepts that
letter, line 2124 prints the letter so the user
will see what she has typed, and line 2140 adds the
letter to what has been typed in so far. Line 2110
is to make sure we don't continue to type the same
letter over and over if a new letter hasn't been
pressed. Finally, when time is up we store the
letters that have been typed in the "accept buffer"
where the rest of the program can compare it to
other strings with a Match statement.

4.   The timing in CATCHIT is similar but a little
        simpler. INstead of trying to keep track of a
        whole answer, we only need to accept any letters
        that are typed and match them with S. If this
        happens in the *GETREADY loop the key was pressed
        too soon since the ball hasn't fallen yet. If it
        happens in the *FALL loop then the user got it
        before the ball went off the =screen. Each loop
        will end if S is pressed. The *GETREADY loop will
        also end if the #WAITing time gets down to 0. The
        *FALL loop will end if the ball falls off the
        screen.

5.   The programs in this unit use several internal
        PILOT variables. Here is a summary of the ones
        that are used:
                        %J0 reads the position of joystick 1
                        %T8 reads the position of the joystick 1
                             trigger button
                        %X   shows the X-coordinate of the turtle
                        %Y   shows the Y-coordinate of the turtle
                        %ST shows the status of the turtle;
                             %ST=2 means the turtle is at or
                             beyond the edge of the screen;
                             %ST=1 means the turtle is at a wall;
                             %ST=0 means neither of these
                             conditions is true
        A more complete description of these and other
        internal variables can be found in the PILOT PRIMER
        and the PILOT II documentation.

Cross Reference

        PILOT PRIMER pages 139 and 182 to 189

```
200 POS:5,5
210 U:*A
220 POS:11,5
230 U:*L
240 POS:17,5
250 U:*P
260 POS:23,5
270 U:*H
280 POS:29,5
290 U:*A
300 PA:200
310 POS:5,15
320 T:REWRITE THE FIRST PART OF THIS PROGRAM TO PUT LETTERS IN DIFFERENT PLACE
ON THE SCREEN.
350 E:
400 R:_____
410 R:
420 R:           THE ALPHABET
430 R:_____
500 *A
510   T: AA \
520   T:A  A\
530   T:AAAA\
540   T:A  A\
550   T:A  A
560 E:
600 *L
610   T:L\
620   T:L\
630   T:L\
640   T:L\
650   T:LLLL
660 E:
700 *P
710   T:PPP \
720   T:P  P\
730   T:PPP \
740   T:P\
750   T:P
760 E:
800 *H
810   T:H  H\
820   T:H  H\
830   T:HHHH\
840   T:H  H\
850   T:H  H
860 E:
```

```
100 POS:1,16
110 T:I SHOT AN ARROW INTO THE AIR.
120 POS:4,18
130 T:IT FELL TO EARTH I KNOW NOT WHERE.
140 PA:200
200 *SHOOTARROW
210    C:#OVER=1
220    SO:29
230    *FLY
240      POS:#OVER,8
250      T:    --->
260      C:#OVER=#OVER+1
270    J(#OVER<33):*FLY
280    SO:1
290    PA:2
300    SO:0
310  E:
```

```
 20 U:*WALL
100 C:#TARGET=?\19+1
110 POS:37,#TARGET
120 T:0
125 *TAKEASHOT
130 POS:5,22
140 T:WHERE'S THE BALLOON?\
150 A:#GUESS
160 C:#DOWN=#GUESS
170 U:*SHOOTARROW
180 J(#GUESS=#TARGET):*GOTIT
190 SO:1                         [THUD]
200 PA:2
210 SO:0
212 U:*ERASETEXT
220 POS:7,21
230 T:TRY AGAIN
240 J:*TAKEASHOT
300 *GOTIT
310    SO:25
320    PA:3
330    SO:0
340    POS:5,10
350    T:YOU GOT IT!!            \
360    POS:7,21
370    T:             \
380    POS:1,19
390   E:
400 *ERASETEXT
410    POS:1,21
420    T:
   \
430    E:
800 *WALL
810    POS:38,0
820    T:0
830    C:#DOWN=1
840    *DRAW
842     POS:38,#DOWN
844     T:
846     C:#DOWN=#DOWN+1
848     J(#DOWN<20):*DRAW
850    POS:37,20
860    T:20
870    E:
900 *SHOOTARROW
910    C:#OVER=1
920    *FLY
930      POS:#OVER,#DOWN
940      T: >>--->
950      C:#OVER=#OVER+1
960    J(#OVER<32):*FLY
970   E:
```

```
 20 T:PLEASE TYPE IN...
 30 T:THE NAME OF A SCHOOL: \
 40 A:$SCHOOL
 50 T:AN ANIMAL: \
 60 A:$ANIMAL
 70 T:A CITY: \
 80 A:$CITY
 90 T:A BIRD: \
100 A:$BIRD
110 T:A NUMBER: \
120 A:$NUMBER
130 T:A CELEBRITY: \
140 A:$CELEB
150 T:A THING: \
160 A:$NOUN
170 T:A MALE CELEBRITY: \
180 A:$MALE
190 T:SOMETHING YOU DID YESTERDAY: \
200 A:$PAST
210 T:NAME OF A BOY IN THE ROOM: \
220 A:$BOY
230 T:ANOTHER THING: \
240 A:$NOUN2
250 T:A CONTAINER: \
260 A:$BOX
270 T:SOMETHING THERE ARE LOTS OF: \
280 A:$PNOUN
290 T:ANOTHER NUMBER: \
300 A:$NUMBER2
310 T:A DESCRIPTIVE WORD: \
320 A:$ADJ
330 R:
340 R:
350 T:}
360 T:Ladies and gentlemen, here we are \
370 T:at the championship basketball game \
380 T:between the $SCHOOL $ANIMAL and the \
390 T:$CITY $BIRD.  The $NUMBER-foot \
400 T:center has just tipped the ball to \
410 T:$CELEB, who dribbles down the $NOUN \
420 T:and passes to $MALE.  Oh, too bad! \
430 T:He just $PAST.  This means $BOY gets \
440 T:a free throw.  He is all set, and \
450 T:there it goes.  He dropped the \
460 T:$NOUN2 right into the $BOX.  This \
470 T:means two $PNOUN and makes the \
480 T:score $NUMBER2 to nothing.  This is \
490 T:certainly a $ADJ game.
500 E:
```

```
  90 *AGAIN
 100 POS:5,5
 110 U:*FLY
 120 J:*AGAIN
 500 *FLY
 510   U:*BIRD1
 512   PA:5
 520   U:*BIRD3
 522   PA:5
 530   U:*BIRD1
 532   PA:5
 540   U:*BIRD2
 542   PA:5
 550 E:
1000 *BIRD1
1010    T:        \
1020    T:        \
1030    E:
1100 *BIRD2
1110    T:        \
1120    E:
1200 *BIRD3
1210    T:        \
1220    T:        \
1230    E:
```

```
 20 C:#TRUE=1
 30 C:#FALSE=0
 40 *START
 50    T:}
 60    C:#TIME=5
 70    C:#DOWN=5
 80    C:#GOTIT=#FALSE
 90    C:#TOOSOON=#FALSE
100    T:    WHEN YOU SEE THE BALL DROP
110    T:
120    T:                PRESS S !
130  : C:#WAIT=?\100+50
140  ' POS:20,#DOWN
150    T:
160  U:*GETREADY
170  J(#TOOSOON):*TOOSOON
200  U:*FALL
204    T:
210    T(#GOTIT):YOU GOT IT IN #TIME HUNDREDTHS OF A SECOND.
220    T(#GOTIT=#FALSE): YOU MISSED IT.
225  *AGAIN
230    T:
240    T:PRESS RETURN TO TRY AGAIN.\
250    A:
260  J:*START
400 *TOOSOON
410    T:IT DIDN'T MOVE YET.
420    J:*AGAIN
500 *GETREADY
510        AK(%K):
520        M:S
530        CY:#TOOSOON=#TRUE
540      EY:
550        C:#WAIT=#WAIT-1
560      J(#WAIT>0):*GETREADY
570    E:
700 *FALL
710      POS:20,#DOWN
720      T: \
722      PA:1
724      C:#TIME=#TIME+5
730      AK(%K):
740      M:S
750      CY:#GOTIT=#TRUE
760    EY:
770      C:#DOWN=#DOWN+1
780    J(#DOWN<23):*FALL
790    POS:20,#DOWN
800    T: \
810    E:
```

```
 10 TURTLE OFF; PEN YELLOW
 20 GR:CLEAR;GOTO -150,0;TURNTO 90
 22 C:#COUNTER=20
 30 *MOVER
 40    U:*TRUCK
 50    PA:5
 52    SO:2
 54    PA:5
 56    SO:3,1
 58    PA:5
 60    GR:GO #COUNTER;CLEAR
 70    C:#COUNTER=#COUNTER-1
 80    J(#COUNTER>0):*MOVER
 85   U:*TRUCK
 90   E:
200 *TRUCK
202    GR:TURN -90
204    GR:3(DRAW 3;TURN 90)
212    U:*WHEEL
214    GR:DRAW 4
216    U:*WHEEL
218    GR:DRAW 6
220    U:*WHEEL
230    GR:DRAW 3;TURN 90
240    GR:DRAW 7;TURN 90
250    GR:DRAW 10;TURN 90
260    GR:DRAW 7;TURN -90
270    E:
300 *WHEEL
302    SO:2,3
310    GR:4(DRAW 2;TURN -90)
312    SO:1,2
320    E:
```

```
 10 C:#T=8
 12 GR:CLEAR
 14 TURTLE OFF
 16 PEN WHITE
 20 *FLY
 30    U:*BIRD1
 32    PA:#T
 34    GR:CLEAR
 40    U:*BIRD2
 42    PA:#T
 44    GR:CLEAR
 50    U:*BIRD3
 52    PA:#T
 54    GR:CLEAR
 60    U:*BIRD2
 62    PA:#T
 64    GR:CLEAR
 70    J:*FLY
100 *BIRD2
110    TURN 45; DRAW 1; TURN 45; DRAW 2; TURN 30; DRAW 2
120    GO -2; TURN -30; GO -2; TURN -45; GO -1
130    TURN -90; DRAW 1; TURN -45; DRAW 2; TURN -30; DRAW 2
140    GO -2; TURN 30; GO -2; TURN 45; GO -1; TURN 45
150   E:
200 *BIRD1
210    TURN 45; DRAW 1; TURN 45; DRAW 1; TURN 30; DRAW 3
220    GO -3; TURN -30; GO -1; TURN -45; GO -1
230    TURN -90; DRAW 1; TURN -45; DRAW 1; TURN -30; DRAW 3
240    GO -3; TURN 30; GO -1; TURN 45; GO -1; TURN 45
250    E:
300 *BIRD3
310  TURN 45; DRAW 1; TURN 25; DRAW 3
320  GO -3; TURN -25; GO -1
330  TURN -90; DRAW 1; TURN -25; DRAW 3
340  GO -3; TURN 25; GO -1; TURN 45
350 E:
```

```
 10  C:#T=8
 12  GR:CLEAR
 14  TURTLE OFF
 16  PEN WHITE
 17  C:#A=-5
 18  C:#OVER=-35
 19  C:#UP=-32
 20  *FLY
 22     C:#A=#A+1
 24     C:#OVER=#OVER+#A
 26     C:#UP=#UP+1
 28     GOTO #OVER,#UP
 30     U:*BIRD1
 32     PA:#T
 34     CLEAR
 36     C:#UP=#UP+1
 38     GOTO #OVER,#UP
 40     U:*BIRD2
 42     PA:#T
 44     CLEAR
 46     C:#UP=#UP+1
 48     GOTO #OVER,#UP
 50     U:*BIRD3
 52     PA:#T
 54     CLEAR
 56     C:#UP=#UP+1
 58     GOTO #OVER,#UP
 60     U:*BIRD2
 62     PA:#T
 64     CLEAR
 70     J:*FLY
100  *BIRD2
110     TURN 45; DRAW 1; TURN 45; DRAW 2; TURN 30; DRAW 2
120     GO -2; TURN -30; GO -2; TURN -45; GO -1
130     TURN -90; DRAW 1; TURN -45; DRAW 2; TURN -30; DRAW 2
140     GO -2; TURN 30; GO -2; TURN 45; GO -1; TURN 45
150   E:
200  *BIRD1
210     TURN 45; DRAW 1; TURN 45; DRAW 1; TURN 30; DRAW 3
220     GO -3; TURN -30; GO -1; TURN -45; GO -1
230     TURN -90; DRAW 1; TURN -45; DRAW 1; TURN -30; DRAW 3
240     GO -3; TURN 30; GO -1; TURN 45; GO -1; TURN 45
250   E:
300  *BIRD3
310   TURN 45; DRAW 1; TURN 25; DRAW 3
320   GO -3; TURN -25; GO -1
330   TURN -90; DRAW 1; TURN -25; DRAW 3
340   GO -3; TURN 25; GO -1; TURN 45
350  E:
```

```
100 POS:2,3
110 T:WHAT'S YOUR LAST NAME?  \
120 A:$FRANKENSTEIN
130 POS:2,6
140 T:WHAT'S YOUR FAVORITE ANIMAL?  \
150 A:$ANIMAL
152 C:$PLURAL=S
154 C:$ANIMALS=$ANIMAL$PLURAL
160 POS:2,9
170 T:WHERE WOULD YOU LIKE TO VISIT?
172 POS:5,11
180 A:$TRANSYLVANIA
190 POS:2,14
200 T:TYPE A WORD THAT MEANS CRAZY:  \
210 A:$MAD
220 R:
230 R:
250 T:}
260 T:
300 U:*CASTLE
310 T:
320 T:     Once upon a time there was a $MAD scientist named Doctor $FRANKENST
IN.\
330 T:  He lived in a castle in $TRANSYLVANIA.  He experimented with electrici
y and dead $ANIMALS.
340 T:
350 T:
360 T:          PRESS RETURN
370 A:
380 T:}
400 T:
410 U:*FRANK
420 T:
430 T:     One day a thunder storm gave an extra boost to his electricity and
e brought one of the dead \
440 T:$ANIMALS back to life.  The $ANIMAL went $MAD and started destroying eve
ything in sight.  \
450 T:Now everybody remembers Doctor $FRANKENSTEIN and $TRANSYLVANIA because c
the $FRANKENSTEIN monster.
1000 E:
2000 *CASTLE
2010  T:
2020  T:
2030  T:
2040  T:                              THE
2050  T:
2060  T:                              $FRANKENSTEIN
2070  T:
2080  T:                              MONSTER
2090  T:
2100  T:
2110  T:
2120 E:
2130 *FRANK
2140     T:
2150     T:
2160     T:
2170     T:
2180     T:
2190     T:     Copyright Atari, Inc.  1983  All rights reserved.
2200     T:
2210     T:                         59
2220     E:
```

```
  10 C:#HIDINGPLACE=17
 100 U:*NUMBERLINE
 200 *GUESS
 210   U:*ERASEQUESTION
 220   PA:60
 230   POS:5,14
 240   T:WHERE DO YOU THINK I'M HIDING? \
 250   A:#GUESS
 260   J(#GUESS=#HIDINGPLACE):*FOUNDHIM
 270   POS:#GUESS,8
 280   T(#GUESS>#HIDINGPLACE):<
 290   T(#GUESS<#HIDINGPLACE):>
 300  J:*GUESS
 310 R:_____
 400 *FOUNDHIM
 410     POS:#HIDINGPLACE-2,2
 420     U:*HURKLE
 430     POS:5,17
 440     T:YOU FOUND HIM! \
 460     E:
 480 R:_____
 600 *ERASEQUESTION
 610        POS:5,14
 620        T:                                  \
 630        E:
 640 R:_____
1000 *HURKLE
1010 T:        \
1020 T:        \
1030 T:        \
1040 T:        \
1050 T:        \
1060 T:
1070 E:
1080 R:_____
1100 *NUMBERLINE
1105 POS:0,9
1110 T:       !     !     !     !     !
1115 POS:0,10
1120 T: ----------------------------
1125 POS:0,11
1130 T:      5    10    15    20    25
1140 E:
```

```
  10 C:0B710=148
 100 POS:5,2
 110 T:HI!  WHAT'S YOUR NAME? \
 120 A:$NAME
 130 POS:5,4
 140 T:ARE YOU A GIRL? \
 150 A:
 160 M:N
 170 CY:$HIM=HIM
 172 CY:$SIBLING=BROTHER
 180 CN:$HIM=HER
 182 CN:$SIBLING=SISTER
 200 POS:5,6
 210 T:WHAT'S YOUR FAVORITE FLAVOR $NAME?
 220 POS:10,8
 230 A:$COLOR
 300 POS:5,10
 310 T:WHAT ARE YOU MOST AFRAID OF?
 320 POS:10,12
 330 A:$MONSTER
 400 POS:5,14
 410 T:IF YOU HAD A BOTHERSOME LITTLE
 412 T:$SIBLING YOU MIGHT CALL $HIM A
 420 T:LITTLE ?\
 430 A:$KID
 500 POS:5,19
 510 T:TYPE IN A WORD THAT MEANS BIG:
 520 POS:10,21
 530 A:$GIANT
 600   C:#RANDOM=?\3
 610   C(#RANDOM=0):$HOUSE=HOUSE
 620   C(#RANDOM=1):$HOUSE=CABIN
 630   C(#RANDOM=2):$HOUSE=COTTAGE
 650   C:#RANDOM=?\4
 660   C(#RANDOM=0):$FOREST=FOREST
 670   C(#RANDOM=1):$FOREST=WOODS
 680   C(#RANDOM=2):$FOREST=MOUNTAINS
 690   C(#RANDOM=3):$FOREST=HILLS
 700   C:#RANDOM=?\3
 710   C(#RANDOM=0):$LITTLE=LITTLE
 720   C(#RANDOM=1):$LITTLE=SMALL
 730   C(#RANDOM=2):$LITTLE=TINY
 750   C:#RANDOM=?\3
 760   C(#RANDOM=0):$CAPER=CAPER
 770   C(#RANDOM=1):$CAPER=AFFAIR
 780   C(#RANDOM=2):$CAPER=INCIDENT
 800 *TITLE
 810 LETTERS:LARGE
 820 POS:1,1
 830 T:the
 835 PA:40
 840 POS:3,4
 850 T:$GIANT
 855 PA:40
 860 POS:5,7
 870 T:$MONSTER
 875 PA:40
 880 POS:7,10
 890 T(#RANDOM=0):CAPER
 892 T(#RANDOM=1):AFFAIR
 894 T(#RANDOM=2):INCIDENT
 900 PA:40
```

```
 900 PA:40
 930 C:#TEMPO=20
 932  SO:1,2,3,4
 940 U:*MUSIC
 950 PA:40
 952 LETTERS:SMALL
 954 T:}
 960 POS:7,1
 970 T:THE $GIANT $MONSTER $CAPER
1000 *STORY
1005 POS:10,9
1010 U:*BOY1
1015 POS:5,14
1020 T:ONCE UPON A TIME THERE WAS A $LITTLE $KID NAMED $NAME.
1025 PA:100
1040 U:*CLICKHEELS
1050 U:*CLICKHEELS
1060 POS:5,18
1070 T:PRESS RETURN.
1080 A:
1090 POS:5,18
1100 T:$NAME LIVED IN A $LITTLE $COLOR $HOUSE IN THE $FOREST.
1120 POS:16,3
1150 U:*HOUSE
1160 C:#TEMPO=8
1162 SO:13,17,20,25
1164 U:*MUSIC
1170 POS:5,21
1180 T:PRESS RETURN.
1190 A:
1200 C:@B710=146     [ DARK BACKGROUND ]
1202 POS:10,9
1204 U:*ERASEBOY
1206 POS:7,1          [ERASE TITLE]
1208 T:                          \
1210 U:*ERASETEXT
1220 C:@B710=144    [ VERY DARK BACKGROUND ]
1230 U:*FIREON
1240 POS:5,14
1250 T:AT NIGHT $NAME WOULD LIGHT A FIRE TO KEEP AWAY THE EVIL $MONSTER.
1270 POS:5,18
1280 T:PRESS RETURN
1285 A:
1290 POS:5,18
1300 T:BUT ONE NIGHT THE WIND BLEW THE FIRE OUT.
1302 C:#TEMPO=1
1310 U:*MUSIC
1320 U:*MUSIC
1330 POS:24,3          [ERASE SMOKE]
1340 T:          \
1350 U:*FLICKER
1360 POS:5,21
1370 T:PRESS RETURN
1380 A:
1390 U:*ERASETEXT
1400 T:ALONG CAME THE $MONSTER.
```

```
1400 T:ALONG CAME THE $MONSTER.
1402 POS:5,16
1405 T:(YOU CAN'T SEE IT BECAUSE IT DOESN'T SHOW UP IN THE DARK.)
1410 POS:5,20
1412 C:#TEMPO=14
1414 SO:4,3,2,1
1416 U:*MUSIC
1420 T:PRESS RETURN
1430 A:
1435 U:*ERASETEXT
1440 U:*EAT
1445 POS:5,14
1450 T:IT GOBBLED UP THE $HOUSE BECAUSE IT THOUGHT IT WAS A $GIANT UPSIDEDOWN $
OLOR ICE CREAM CONE.
1460 POS:5,20
1470 T:PRESS RETURN
1472 A:
1480 U:*ERASETEXT
1490 C:#BOYALIVE=?\3
1500 T(#BOYALIVE):$NAME GOT OUT JUST IN TIME AND RAN AWAY INTO THE $FOREST.
1510 T(#BOYALIVE=0):$NAME HID INSIDE AND THE $MONSTER ATE $HIM TOO.
1520 PA:100
1550 U:*GETAWAY
1560 POS:5,18
1570 T:PRESS RETURN
1580 A:
1590 U:*ERASETEXT
1600 T:SO DON'T PAINT YOUR $HOUSE $COLOR OR THE $MONSTER MIGHT GET YOU!
1620 C:#TEMPO=10
1622 SO:1,2,3,4
1630 U:*MUSIC
1632 SO:1,3,5,6
1640 U:*MUSIC
1642 SO:3,5,7,8
1650 U:*MUSIC
1652 SO:1,2,3,4
1660 U:*MUSIC
1890 C:@B710=148
1900 E:
2000 *BOY1
2010 T:     \
2020 T:     \
2030 T:     \
2040 T:     \
2050 E:
2060 *BOY2
2070 T:     \
2080 T:     \
2090 T:     \
2100 T:     \
2110 E:
2120 *BOY3
2130 T:     \
2140 T:     \
2150 T:     \
2160 T:     \
2170 E:
2180 *HOUSE
```

```
2180 *HOUSE
2190 T:              \
2200 T:              \
2210 T:              \
2220 T:              \
2230 T:              \
2240 T:              \
2250 T:              \
2260 T:              \
2270 T:              \
2280 T:              \
2290 E:
2300 *BIGWINDOW
2310    T:        \
2320    T:        \
2330    T:        \
2340    T:        \
2350   E:
2360 *DARKBIGWINDOW
2370    T:        \
2380    T:        \
2390    T:        \
2400    T:        \
2410   E:
2420 *LITTLEWINDOW
2430     T: \
2440    E:
2450 *DARKLITTLEWINDOW
2460     T: \
2470    E:
2480 *CHOMP
2485     SO:1,2,3,4
2490    T:          \
2500    T:          \
2510    T:          \
2520    T:          \
2522    PA:8
2525    SO:0
2530   E:
2600 *CLICKHEELS
2610 POS:10,9
2620 U:*BOY1
2630 PA:20
2640 POS:10,9
2650 U:*BOY3
2660 PA:5
2670 POS:10,9
2680 U:*BOY2
2682 SO:31
2684 PA:1
2686 SO:0
2690 PA:12
2700 POS:10,9
2710 U:*BOY3
2720 PA:5
2730 POS:10,9
2740 U:*BOY1
2750 E:
2800 *ERASEBOY
```

```
2800 *ERASEBOY
2810 T:      \
2820 T:      \
2830 T:      \
2840 T:      \
2850 E:
2900 *FIREON
2910      U:*LIGHTSON
2940      SO:4,3,2,1
2942      PA:10
2950      POS:24,3
2952      T:ɔɔɔɔɔ
2956      SO:1,3,4,5
2958      PA:10
2960      POS:24,2
2962      T:ɔ ɔ  \
2966      SO:1,2,3,4
2968      PA:10
2970      POS:24,3
2972      T:ɔ ɔɔ ɔɔ
2980      SO:0
2990    E:
3000 *FLICKER
3010      U:*LIGHTSOFF
3020      U:*MUSIC
3030      U:*LIGHTSON
3040      U:*MUSIC
3042      U:*MUSIC
3044      U:*MUSIC
3050      U:*LIGHTSOFF
3060      U:*MUSIC
3062      U:*MUSIC
3070      U:*LIGHTSON
3080      U:*MUSIC
3090      U:*LIGHTSOFF
3095    E:
3100 *LIGHTSOFF
3110      POS:21,6
3112      SO:4,5,6,7
3120      U:*DARKLITTLEWINDOW
3122      SO:3,4,7,8
3130      POS:21,8
3140      U:*DARKBIGWINDOW
3142      SO:0
3145    E:
3150 *LIGHTSON
3160      POS:21,6
3162      SO:4,5,6,7
3170      U:*LITTLEWINDOW
3172      SO:3,4,7,8
3180      POS:21,8
3190      U:*BIGWINDOW
3192      SO:0
3195    E:
3200 *ERASETEXT
```

```
3200 *ERASETEXT
3210 POS:5,14
3220 T:

3225 T:

3230 T:

3235 POS:5,14
3240 E:
3300 *EAT
3310    POS:22,8
3320    U:*CHOMP
3325    PA:30
3330    POS:20,9
3340    U:*CHOMP
3350    POS:23,6
3360    U:*CHOMP
3390   E:
3400 *GETAWAY
3410       POS:12,9
3420       U(#BOYALIVE):*BOY1
3430       POS:24,3
3440       U:*ERASEBOY
3450       POS:21,7
3460       U:*CHOMP
3470       POS:12,9
3480       U(#BOYALIVE):*MOVEBOY
3490       POS:17,9
3500       U:*CHOMP
3510       POS:19,8
3520       U:*CHOMP
3530       POS:11,9
3540       U(#BOYALIVE):*MOVEBOY
3550       POS:21,5
3560       U:*CHOMP
3570       POS:18,7
3580       U:*CHOMP
3590       POS:10,9
3600       U(#BOYALIVE):*MOVEBOY
3610       POS:16,9
3620       U:*ERASEBOY
3630       POS:16,7
3640       U:*CHOMP
3650       POS:17,6
3660       U:*CHOMP
3670       POS:9,9
3680       U(#BOYALIVE):*MOVEBOY
3690       POS:16,4
3700       U:*ERASEBOY
3710       POS:19,4
3720       U:*ERASEBOY
3730       POS:22,5
3740       U:*ERASEBOY
3750       POS:16,7
3760       U:*ERASEBOY
3790       E:
3800 *MOVEBOY
```

```
3800  *MOVEBOY
3810     U:*BOY3
3812     PA:5
3820     T:\
3830     U:*ERASEBOY
3840     T:\
3850     U:*BOY2
3852     PA:5
3860     T:\
3865     SO:7
3870     U:*BOY1
3875     SO:0
3880     E:
4000  *MUSIC
4010     SO:=,=,=,=
4020     PA:#TEMPO
4030     SO:+1,+1,+2,+3
4040     PA:#TEMPO
4050     SO:+2,+3,+3,+2
4060     PA:#TEMPO
4070     SO:+3,+2,+1,+1
4080     PA:#TEMPO
4090     SO:-4,-3,-2,-1
4100     PA:#TEMPO
4110     SO:-1,-1,-1,-1
4120     PA:#TEMPO*3
4130     SO:0
4140     E:
```

```
 20 T:I'M THINKING OF A GROUP OF WORDS.
 30 T:
 40 T:TYPE A WORD AND I'LL TELL YOU IF YOUR WORD IS IN THE GROUP OR OUT OF IT.
 50 T:
 60 T:FOR EXAMPLE, BED IS IN BUT BAG IS OUT.
 70 T:
 80 T:FIND AS MANY WORDS AS YOU CAN THAT ARE IN THE GROUP.
 90 T:
100 T:WHEN YOU ARE DONE TYPE DONE AND I WILL TELL YOU WHAT THE GROUP IS.
110 T:
120 C:#IN=0
130 C:#OUT=0
140 R:_____
200 T:
210 *REPEAT
220    T:    WORD? \
230    A:$WORD
240    M:DONE
250    JY:*END
260    M:E
270    JN:*OUT
280    JY:*IN
300 *IN
310    T:                    $WORD IS IN.
320    C:#IN=#IN+1
330   J:*REPEAT
400 *OUT
410    T: $WORD IS OUT.
420    C:#OUT=#OUT+1
430   J:*REPEAT
440 R:_____
500 *END
510   T:
520   T:  EVERY WORD WITH AN 'E' IN IT IS IN THE GROUP.
530   T:
610   T:
620   T:YOU GOT #IN IN.
630   T:YOU GOT #OUT OUT.
640   E:
```

```
100 T:WHAT IS A WORD THAT RHYMES WITH FAR?
110 A:$STAR
120 T:
130 T:TYPE THE NAME OF A PLACE:
140 A:$THEWORLD
150 T:
160 T:WHAT IS YOUR FAVORITE JEWEL?
170 A:$DIAMOND
180 T:
190 T:GIVE ME A TWO SYLABBLE VERB:
200 A:$TWINKLE
210 T:}
220 C:#TEMPO=10
300 U:*TWINK
310 POS:2,6
320 T:$TWINKLE, $TWINKLE LITTLE $STAR
330 U:*PHRASE1
340 U:*TWANK
350 POS:2,9
360 T:HOW I WONDER WHAT YOU ARE
370 U:*PHRASE2
380 U:*TWINK
390 POS:2,12
400 T:UP ABOVE $THEWORLD SO HIGH
410 U:*PHRASE3
420 U:*TWANK
430 POS:2,15
440 T:LIKE A $DIAMOND IN THE SKY
450 U:*PHRASE3
460 U:*TWINK
470 POS:2,18
480 T:$TWINKLE, $TWINKLE LITTLE $STAR
490 U:*PHRASE1
500 U:*TWANK
510 POS:2,21
520 T:HOW I WONDER WHAT YOU ARE
530 U:*PHRASE2
540 *TWINKLE
550     U:*TWINK
560     PA:6
570     U:*TWANK
580     PA:8
590     J:*TWINKLE
1000 *TWINK
1010    POS:5,2
1020    T:              *           +      .          *       #
+              .                 *
1030    E:
1100 *TWANK
1110    POS:5,2
1120    T:*           .      +          .      #        +          *
              *           #
1130    E:
1200 *PHRASE1
1210       SO:13
1220       PA:#TEMPO
1230       SO:0
1240       PA:1
1250       SO:13
1260       PA:#TEMPO
1270       SO:20
1280       PA:#TEMPO-1
1290       SO:0
```

```
1290        SO:0
1300        PA:1
1310        SO:20
1320        PA:#TEMPO
1330        SO:22
1340        PA:#TEMPO-1
1350        SO:0
1360        PA:1
1370        SO:22
1380        PA:#TEMPO
1390        SO:20
1400        PA:2*#TEMPO
1410        SO:0
1420     E:
1500 *PHRASE2
1510        SO:18
1520        PA:#TEMPO
1530        SO:0
1540        PA:1
1550        SO:18
1560        PA:#TEMPO
1570        SO:17
1580        PA:#TEMPO-1
1590        SO:0
1600        PA:1
1610        SO:17
1620        PA:#TEMPO
1630        SO:15
1640        PA:#TEMPO-1
1650        SO:0
1660        PA:1
1670        SO:15
1680        PA:#TEMPO
1690        SO:13
1700        PA:2*#TEMPO
1710        SO:0
1720     E:
1800 *PHRASE3
1810        SO:20
1820        PA:#TEMPO
1830        SO:0
1840        PA:1
1850        SO:20
1860        PA:#TEMPO
1870        SO:18
1880        PA:#TEMPO-1
1890        SO:0
1900        PA:1
1910        SO:18
1920        PA:#TEMPO
1930        SO:17
1940        PA:#TEMPO-1
1950        SO:0
1960        PA:1
1970        SO:17
1980        PA:#TEMPO
1990        SO:15
2000        PA:2*#TEMPO
2010        SO:0
2020     E:
```

```
 10 C:#OVER=18
 20 C:#DOWN=11
 22 POS:2,22
 24 T:PRESS ANY ARROW TO MOVE AND
 25 T: ANY OTHER KEY TO CHANGE SHAPE
 26 C:$LETTER=
 30 POS:#OVER,#DOWN
 40 U:*CURSOR
 50 POS:#OVER,#DOWN
 90 *START
100 AK:$CHAR
101     M:,,,
102     JM:*UP,*DOWN,*LEFT,*RIGHT
103     C:$LETTER=$CHAR
104   J:*START
110   *UP
114     C:#DOWN=#DOWN-1
116     J:*MOVE
120   *DOWN
126     C:#DOWN=#DOWN+1
128     J:*MOVE
130   *LEFT
136     C:#OVER=#OVER-1
138     J:*MOVE
140   *RIGHT
146     C:#OVER=#OVER+1
200  *MOVE
210    U:*TRAIL
220    POS:#OVER,#DOWN
230    U:*CURSOR
240    POS:#OVER,#DOWN
250  J:*START
500 *CURSOR
510     T:+
520     E:
600 *TRAIL
610     T:$LETTER
620     E:
```

```
 10 C:#OVER=18
 20 C:#DOWN=11
 22 POS:2,22
 24 T:PRESS THE ARROWS TO MOVE THE SHIP
 30 POS:#OVER,#DOWN
 40 U:*SHIP
 50 POS:#OVER,#DOWN
 90 *START
100   AK:
110   M:,,,
111   JM:*UP,*DOWN,*LEFT,*RIGHT
112   J:*START
113    *UP
114      C:#DOWN=#DOWN-1
116      J:*MOVE
120    *DOWN
126      C:#DOWN=#DOWN+1
128      J:*MOVE
130    *LEFT
136      C:#OVER=#OVER-1
138      J:*MOVE
140    *RIGHT
146      C:#OVER=#OVER+1
200   *MOVE
210    U:*ERASE
220    POS:#OVER,#DOWN
230    U:*SHIP
240    POS:#OVER,#DOWN
250   J:*START
500 *SHIP
510     T:        \
512     T:        \
514     T:        \
520     E:
600 *ERASE
610     T:        \
612     T:        \
614     T:        \
620     E:
```

```
  2 C:#TRUE=1
  4 C:#FALSE=0
  6 *REQUEST
  8   T:GIVE ME A WORD
 10   AX:$LETTERS
 20   T:THESE ARE THE LETTERS IN THE WORD:
 22   C:$FIRSTLETTER=
 30 *REPEAT
 40   U:*GETFIRSTLETTER
 50   T:$FIRSTLETTER \
 60   C:$LETTERS=$RESTOFLETTERS
 70   J(#MORELETTERS=#TRUE):*REPEAT
 80 T:
 90 J:*REQUEST
100 R:------------------------------------------------------------
300 *GETFIRSTLETTER
310   AX:=$LETTERS
320   MS:,                  [ SKIP FIRST LETTER AND MATCH ON ANYTHING ]
330   JN:*NOLETTERSLEFT     [ THERE WASN'T ANYTHING AFTER FIRST LETTER ]
331   R: THERE'S MORE THAN ONE LETTER SO WE WILL MATCH ON ALL THOSE LETTERS TO
THE RIGHT OF THE FIRST LETTER.
332   MS:$RIGHT
336   R:  NOW THE FIRST LETTER IS TO THE LEFT OF THE REST OF THE LETTERS UNLES
ALL THE LETTERS ARE THE SAME
338   R:IN WHICH CASE IT IS ON THE RIGHT.
340   C:$FIRSTLETTER=$LEFT$RIGHT
350   C:$RESTOFLETTERS=$MATCH
352   C:#MORELETTERS=#TRUE
360   E:
370   *NOLETTERSLEFT
380   C:$FIRSTLETTER=$LETTERS
390   C:$RESTOFLETTERS=
392   C:#MORELETTERS=#FALSE
395   E:
```

```
200 POS:10,20
210 T:I'm out to lunch.
300 POS:2,5
310 U:*BUNNY
312 *AGAIN
320 C:#COUNTER=0
330 *LUNCH
350   U:*EAT
360   C:#COUNTER=#COUNTER+1
370   J(#COUNTER<5):*LUNCH
380  U:*WINK
382 PA:20
390 J:*AGAIN
400 *BUNNY
410    T:
420    T:
430    T:
440    T:
450    T:
460    T:
470    T:
480    T:
490    T:
500    T:
510    T:
520   E:
600 *NIBBLE
620    T:\/\
630    PA:5
632    SO:1
640    T:\
642    SO:0
650    PA:2
660   E:
700 *EAT
710   POS:23,14
720   U:*NIBBLE
730   U:*NIBBLE
740   POS:1,18
750  E:
800 *WINK
810   POS:23,12
820   T:-\
830   PA:8
840   T:O\
842   PA:1
850   T:
\
860   POS:1,14
870  E:
```

```
100 POS:1,2
110 T:WHAT IS THE NAME OF YOUR CAMP?
115 POS:5,3
120 A:$CAMP
130 POS:1,5
140 T:WHAT IS THE NAME OF YOUR COUNSELOR?
145 POS:5,6
150 A:$COUNSELOR
160 POS:1,8
170 T:GIVE ME A NUMBER BIGGER THAN 2:
175 POS:5,9
180 A:$NUMBER
190 POS:1,11
200 T:WHAT IS THE NAME OF YOUR CAMP DIRECTOR?
205 POS:5,13
210 A:$DIRECTOR
220 POS:1,15
230 T:NAME A REALLY STRANGE LOOKING ANIMAL:
240 POS:5,16
250 A:$ANIMAL
300 LETTERS:LARGE
310 POS:1,1
320 T:THE
330 POS:3,4
340 T:█▐▛▞▟▙
350 POS:5,7
360 T:MARTIAN
370 POS:7,10
380 T:chronicles
390 SO:6,7
400 PA:40
410 SO:4,5
420 PA:160
450 LETTERS:SMALL
460 POS:30,2
470 T:              \
472 T:              \
474 T:              \
476 T:
478 T:
480 T:
```

```
510 T:DEAR MARTIAN COMMANDER,
520 T:
522 T:
530 T:        WE HAVE JUST LANDED ON \
532 T:PLANET EARTH IN A STRANGE PLACE \
534 T:CALLED $CAMP.   THERE ARE MANY \
540 T:ODD-LOOKING LIFE FORMS HERE, BUT THE STRANGEST OF ALL IS $COUNSELOR.    TH
S IS BECAUSE \
550 T:$COUNSELOR HAS $NUMBER EARS.
551 POS:15,22
552 T:PRESS RETURN
553 A:
554 T:}
555 T:        THE MOST INTERESTING TIME OF DAY AT $CAMP IS WHAT THE EARTHLINGS \
560 T:CALL "DINNER TIME".   YESTERDAY THEY CONSUMED LARGE QUANTITIES OF FRIED $
NIMAL.   LATER A FIENDISH \
570 T:MONSTER CALLED $DIRECTOR APPEARED AND SCARED AWAY ALL THE CAMPERS.
572 T:
580 T:        TUNE IN TOMORROW FOR THE FURTHER ADVENTURES AT $CAMP.
690 T:
692 T:            SINCERELY,
694 T:
700 T:
710 T:
720 T:
730 T:                            \
800 PA:900
810 T:            [ TO MOVE CURSOR UP SO THE SCREEN WON'T SCROLL WHEN THE   PROGRA
ENDS AND READY IS PRINTED ]
```

```
  5 *START
 10 T:GIVE ME A NUMBER: \
 20 A:#IN
 30 T:IF YOU GIVE ME #IN
 40 C:#OUT=#IN/2+3
 50 T:          THEN I WILL TYPE #OUT.
 52 J(#OUT=7):*GOTIT
 60 T:
 70 T:TRY TO MAKE ME TYPE 7.
 80 J:*START
100 *GOTIT
102   SO:13
104   PA:10
106   SO:0
108 T:
110   T:CONGRATULATIONS YOU DID IT!
112   SO:18
114   PA:40
120   E:
```

```
1000 T:
1010 T:
1020 T:
1030 T:
1040 T:
1050 T:
1060 T:
1070 T:
1080 T:
1090 T:
1100 T:
1110 T:
1120 T:
1130 T:
1140 T:
1150 T:
1160 T:
1170 T:
1180 T:
1190 T:
1200 T:
```

```
 10 R:This is a riddle program introducing  M: and conditionals.
 20 T:
 30 T:Hi, what is the answer to this riddle?\
 40 T:
 50 U:*BUNNY
 60 T:
 70 T:How do you catch an unique rabbit?
 80 T:
 90 A:$ANSWER
100 M:YOU NEEK, YOU NEAK, YOU NIQUE
110 TY:Wow!  You are great.  That's right!
120 TN: No, you neek up on it.
130 E:
400 *BUNNY
410     T:
420     T:
430     T:
440     T:
450     T:
460     T:
470     T:
480     T:
490     T:
500     T:
510     T:
520   E:
```

```
 10 R:This program will demonstrate the    use of M:,JM:,TY:,TN:,JY:,T: and
A: commands.
 12 T:
 20 T: What lies shivering at the bottom of the ocean?  \
 30 A:
 40 M: NERVOUS WRECK
 50 TY: Yes, that's correct.
 60 CY:#SCORE=1
 70 TN: No, a nervous wreck.
 80 CN:#SCORE=0
 90 T:Press Return
 95 A:
 98 R:_____
100 T:}
110 T: What is black, white, and red all over?  \
120 A:
130 M: ZEBRA,PAPER
140 JM:*ZEBRA,*PAPER
150 TN:No, an embarassed zebra is the correct answer.
160 J:*NEXT
200 *ZEBRA
205 C:#SCORE=#SCORE+1
210 T: You're right an embarassed zebra is black, white and red all over.
220 J:*NEXT
260 *PAPER
270 T: No, a newspaper is black, white, and READ all over, but it's not RED al
over.
272 T: The answer is an embarassed zebra.
273 R:_____
274 *NEXT
276 T:
278 T: Do you want to try another riddle?
280 A:
290 M:Y
310 JN:*END
340 T:}
350 T:What do ghosts drink?
360 A:
370 M:GHOUL
380 CY:#SCORE=#SCORE+1
390 TY:Right!
400 TN:No, ghoulade.
410 R:_____
500 *END
510 T:
520 T:That's all for now folks.
530 T:
540 T:    You got #SCORE right.
550 E:
```

```
 10 R:PROGRAM TO GENERATE AND PRINT
 20 R:RANDOM NUMBERS
 30 *AGAIN
 40 R:GENERATE A RANDOM NUMBER
 50 R:AND STORE IT IN VARIABLE #R
 60 C:#RANDOM=?
 70 R:TYPE THE NUMBER ON THE SCREEN
 80 T:#RANDOM
 90 R:PAUSE FOR 1 SECOND AND THEN
100 R:DO IT AGAIN
110 PA:60
120 J:*AGAIN
130 E:
```

```
 20 C:#COUNTER=1
 30 *REPEAT
 40   U:*SENTENCE
 50   C:#COUNTER=#COUNTER+1
 60   J(#COUNTER<6):*REPEAT
 80   E:
100 *SENTENCE
110    T:THE \
120    U:*ADJECTIVE
130    T:$WORD \
140    U:*NOUN
150    T:$WORD \
160    U:*VERBNEEDINGOBJECT
170    T:$WORD \
180    T:THE \
190    U:*ADJECTIVE
200    T:$WORD \
210    U:*NOUN
220    T:$WORD \
230    T:AND \
240    U:*VERBWITHOUTOBJECT
250    T:$WORD \
260    U:*PREPOSITION
270    T:$WORD \
280    T:THE \
290    U:*ADJECTIVE
300    T:$WORD \
310    U:*NOUN
320    T:$WORD.   \
340    E:
500 *NOUN
510    C:#R=?\5
520    C(#R=0):$WORD=DOG
530    C(#R=1):$WORD=CAT
540    C(#R=2):$WORD=MOUSE
550    C(#R=3):$WORD=AARDVARK
560    C(#R=4):$WORD=BUFFALO
570    E:
600 *ADJECTIVE
610    C:#R=?\5
620    C(#R=0):$WORD=HAPPY
630    C(#R=1):$WORD=SAD
640    C(#R=2):$WORD=ANGRY
650    C(#R=3):$WORD=UGLY
660    C(#R=4):$WORD=BEAUTIFUL
670    E:
700 *VERBNEEDINGOBJECT
710    C:#R=?\5
720    C(#R=0):$WORD=SWALLOWED
730    C(#R=1):$WORD=ATE
740    C(#R=2):$WORD=SAW
750    C(#R=3):$WORD=KISSED
760    C(#R=4):$WORD=FOLLOWED
770    E:
800 *PREPOSITION
```

```
800  *PREPOSITION
810     C:#R=?\5
820     C(#R=0):$WORD=AROUND
830     C(#R=1):$WORD=ON
840     C(#R=2):$WORD=AT
850     C(#R=3):$WORD=UNDER
860     C(#R=4):$WORD=OVER
870     E:
900  *VERBWITHOUTOBJECT
910     C:#R=?\5
920     C(#R=0):$WORD=JUMPED
930     C(#R=1):$WORD=DANCED
940     C(#R=2):$WORD=WALKED
950     C(#R=3):$WORD=SAT
960     C(#R=4):$WORD=SLEPT
970     E:
```

```
  2 C:#TRUE=1
  3 C:#FALSE=0
  5 T:GIVE ME A LIST OF NOTES SEPARATED BY COMMAS: \
 10 A:$NOTES
 20 T:GIVE ME A TEMPO:\
 22 A:#TEMPO
 25 C:$LIST=$NOTES
 30 C:$NUMBER=0
 32 U:*MAKEARRAY
 36 T:HERE'S A RANDOM TUNE WITH THOSE NOTES.
 40 U:*PLAYNOTES
 90 E:
100 *PLAYNOTES
120 C:#ITEM=?\#NUMBER
122 C:$NUMBER=#ITEM
124 C:$NOTE=NOTE$NUMBER
126 A:#NOTE=$$NOTE
130 SO:#NOTE
140 PA:#TEMPO
160 J:*PLAYNOTES
300 *GETFIRST
310  A:=$LIST
320  MS:!,
330  JN:*NOLIST
340  C:$FIRST=$LEFT
350  C:$REST=$RIGHT
352  C:#MORENOTES=#TRUE
360  E:
370  *NOLIST
380  C:$FIRST= $LIST
390  C:$REST=
392  C:#MORENOTES=#FALSE
395  E:
500 *MAKEARRAY
510   U:*GETFIRST
520   C:$STRING=NOTE$NUMBER
530  ·C:$$STRING=$FIRST
532   C:$LIST=$REST
540   A:#NUMBER=$NUMBER
550   C:#NUMBER=#NUMBER+1
560   C:$NUMBER=#NUMBER
570   J(#MORENOTES):*MAKEARRAY
580   E:
```

```
 10 R:RANDOM TURTLE WALK
 30 GR:CLEAR
 50 GR:GOTO 0,0
 70 T:            RANDOM TURTLE WALK
 90 *NEXTSTEP
110 GR:GO 2
130 C:#ANGLE=?\360
150 GR:TURN #ANGLE
170 J:*NEXTSTEP
190 E:
```

```
 100 C:#DOWN=18
 102 POS:25,#DOWN+1
 110 U:*ROCKET
 120 C:#COUNT=10
 130 *COUNTDOWN
 140    POS:5,22-#COUNT
 150    T:#COUNT
 160    SO:#COUNT
 170    PA:60
 180    C:#COUNT=#COUNT-1
 190  J(#COUNT>=0):*COUNTDOWN
 195  T:           BLASTOFF!! \
 200 *BLASTOFF
 210      POS:25,#DOWN
 220      U:*ROCKET
 230      C:#DOWN=#DOWN-1
 240      C:#NOTE=31-#DOWN
 250      SO:#NOTE
 260    J(#DOWN>0):*BLASTOFF
 300 *ERASESHIP
 302   POS:25,1
 310   T:    \
 320   T:    \
 330   T:    \
 340   T:     \
 400   E:
1000 *ROCKET
1010   T:    \
1020   T:    \
1030   T:    \
1040   T:     \
1050   T:     \
1070   E:
```

```
 10 TURTLE OFF
 20 C:#TRUE=1
 22 C:#FALSE=0
 30 U:*DRAWMAZE
 40 U:*PLACETREASURE
 50 GOTO 75,0
 52 TURTLE WHITE
 60 TURTLE ON
 70 T:USE THE JOYSTICK TO
 80 T:FIND THE TREASURE.
 82 C:#TREASUREFOUND=#FALSE
 90 *TREASURESEARCH
100      U:*READANGLE
110      TURNTO #ANGLE
120      GR( %JO>0 ):DRAW 2
130      SO( %ST=1 ):13
140      SO( %ST=1 ):0
150      U:*TREASURECHECK
160      J(#TREASUREFOUND=#TRUE):*PART2
200      J:*TREASURESEARCH
300 *READANGLE
310  C(%JO=1):#ANGLE=0
320  C(%JO=2):#ANGLE=180
330  C(%JO=4):#ANGLE=270
340  C(%JO=5):#ANGLE=315
350  C(%JO=6):#ANGLE=225
360  C(%JO=8):#ANGLE=90
370  C(%JO=9):#ANGLE=45
380  C(%JO=10):#ANGLE=135
390 E:
500 *TREASURECHECK
510      R:FIRST WE COMPUTE HOW FAR AWAY THE TREASURE IS.
511      C:#DX=#TX-%X
512      C:#DY=#TY-%Y
513      C(#DX<0):#DX=-#DX
514      C(#DY<0):#DY=-#DY
515      C:#D=#DX+#DY
516      R:#D MEASURES HOW FAR AWAY THE TURTLE IS FROM THE TREASURE.
520      C(#D<6 ):#TREASUREFOUND=#TRUE
530 E:
700 *PLACETREASURE
710      C:#TX=-14
720      C:#TY=-10
730      GOTO #TX,#TY
732      U:*DRAWTREASURE
740      E:
800 *DRAWTREASURE
810      PEN GOLD
820      TURNTO-90;GO3;TURN150;DRAW4;TURN60;DRAW4;TURN90;DRAW3;TURN60;DRAW4;TUR
60;DRAW3;TURN120;DRAW6;GO-3
830      PENUP
840      E:
1000 *TICKER
1010     PA:60
1020     SO:1
1030     PA:3
1040     SO:0
1050     PA:60
1060     E:
```

```
1060    E:
1100 *TICK
1110    SO:#BOMB
1120    C:#TIMER=#TIMER+1
1130    C(#TIMER>20):#BOMB=#BOMB+1
1150    C(#TIMER>20):#DARK=#DARK-1+#FLASKFULL
1160    SETPEN(#DARK>-1):1,4,#DARK
1170    SETPEN(#DARK<0):1,0,0
1172    C(#DARK<-2):#DARK=0
1180    C(#TIMER>20):#TIMER=0
1190    SO:0
1192    E:
1210 *DRAWMAZE
1212 CLEAR
1214 PEN RED
1220 SETPEN:1,4,7
1230 TURTLE OFF; PEN 1
1240 GOTO 42,10;TURNTO 90;DRAW 14;TURN90;DRAW 10;TURN -90;DRAW 14;TURN 90;DRAW
0;TURN 90;DRAW 21;GO -21
1250 TURN -90;DRAW 5;TURN 90;DRAW 140;TURN 90;DRAW 35;TURN 90; DRAW 7;TURN 90;D
AW 5;TURN -90;DRAW 7;GO -7
1260 TURN 90;DRAW 5;TURN -90;DRAW 14;GO -7;TURN 90;DRAW 10;GO -5;TURN 90;DRAW 7
TURN -90;GO 5;DRAW 10;TURN -90
1270 DRAW 70;GO -7;TURN -90;DRAW 5;TURN 90;DRAW 14;TURN 90;DRAW 10;GO -20;DRAW
5;TURN 90;DRAW 7;TURN 90;DRAW 25
1280 GO -10;TURN -90;DRAW 14;TURN 90;DRAW 10;TURN 90;DRAW 7;TURN 90;DRAW 5;GO 1
;DRAW 5;TURN 90;DRAW 21;GO -7
1290 TURN 90;DRAW 10;GO -5;TURN -90;DRAW 35;TURN 90;GO 5;DRAW -15;TURN 90;DRAW
;TURN -90;GO 40;DRAW 5;TURN -90
1300 DRAW 14;TURN -90;DRAW 5;TURN 90;DRAW 7;TURN -90;DRAW 10;TURN -90;DRAW 28;T
RN 90;DRAW 5;TURN 90;DRAW 7
1310 TURN -90;DRAW 5;TURN 90;DRAW 7;TURN 90;DRAW 5;GO 10;DRAW 5;GO -5;TURN 90;G
 -7;DRAW 28;TURN 90;DRAW 15
1320 2(TURN 90;DRAW 7;TURN -90;DRAW 5);GO 5;TURN -90;DRAW 7;TURN 90;DRAW 10;TUR
 90;DRAW 14;TURN -90;DRAW 5
1330 TURN -90;DRAW -14;GO 21;DRAW 35;TURN -90;DRAW 5;TURN 90;DRAW 28;TURN 90;DR
W 10;TURN -90;DRAW 14;TURN -90
1340 DRAW 15;GO 35;DRAW 5;TURN 90;DRAW 7;GO 21;TURN 90;DRAW 15;TURN 90;DRAW 14;
URN -90;DRAW 10;GO -5;TURN 90
1350 DRAW 7;TURN 90;DRAW 5;2(DRAW 5;TURN -90;DRAW 7;TURN 90);DRAW -5;GO 10;DRAW
5;TURN 90;DRAW 7;TURN -90;DRAW 5
1360 GO -5;TURN 90;GO 7;DRAW 14;TURN 90;DRAW 15;TURN 90;DRAW 14;GO 49;DRAW 14;G
 -42;TURN -90;DRAW 5;TURN -90
1370 DRAW 14;TURN 90;DRAW 10;TURN 90;DRAW 14;GO -7;TURN -90;DRAW 5;TURN -90;DRA
 7
1372 2(DRAW 14;TURN 90;DRAW 10;TURN -90);TURN 180
1380 DRAW 21;TURN -90;DRAW 10;GO -55;TURN -90;2(DRAW 7;TURN -90;DRAW 5;TURN 90)
GO 7;DRAW 7;GO -56;DRAW 7;TURN 90
1390 DRAW 10;TURN -90;DRAW 7;TURN 90;GO 45;DRAW -10;TURN 90;DRAW 49;TURN -90;DR
W 10;GO -5;TURN 90;DRAW 7;TURN 90
1400 DRAW 10;GO 10;2(TURN 90;DRAW 7;TURN -90;DRAW 5);TURN -90;DRAW 7;TURN 90;DR
W 20;TURN -90;DRAW 14;GO 35
1410 DRAW -7;TURN 90;GO -20;TURN 90;DRAW 7;TURN 90;DRAW 10;GO -5;TURN 90;DRAW 1
;TURN 90;DRAW 30;TURN 90;DRAW 140
1420 TURN 90;DRAW 40;TURN 90;DRAW 7;TURN 90;DRAW 5;GO 5;TURN -90;DRAW 7;TURN -9
;DRAW 5;GO 20;TURN 90;DRAW 14
1430 TURN 90;DRAW 10;TURN -90;DRAW 21;TURN 90;DRAW 5;TURN -90;DRAW 7;TURN 90;DR
W 25;TURN -90;DRAW 28;TURN 90
1440 DRAW 10;TURN 90;DRAW 7;TURN -90;DRAW 5;GO -40;DRAW 10;GO -5;TURN 90;DRAW 7
TURN 90;GO -30;DRAW 5;TURN 90
1442 GO -21;DRAW 28;GO 21;DRAW 7;TURN 90;DRAW 10;TURN 90;GO 42;TURN 90;DRAW 5;G
 25;TURN -90;GO 7;DRAW 14
1450 WALL 1; EDGE HALT
1460 E:
2000 *PART2
```

```
2000  *PART2
2010  QUIT
2020  POS:10,4
2030  T:CONGRATULATIONS!
2040  C:#TEMPO=8
2050  SO:13
2060  U:*FANFARE
2250  POS:5,7
2260  T:YOU FOUND THE TREASURE CHEST.
2270  POS:5,10
2280  C:#TEMPO=9
2282  SO:15
2284  U:*FANFARE
2290  T:BUT THE CHEST IS EMPTY.
2300  POS:5,13
2310  C:#TEMPO=10
2312  SO:17
2314  U:*FANFARE
2320  T:EXCEPT FOR A SMALL FLASK . . .
2330  POS:5,16
2340  C:#TEMPO=11
2342  SO:18
2344  U:*FANFARE
2350  T:AND A NOTE WHICH SAYS . . .
2360  C:#TEMPO=12
2362  SO:20
2364  U:*FANFARE
2410  T:}
2420  T:    THE TREASURE OF THE BLUE SAPHIRE IS WELL PROTECTED.
2422  U:*TICKER
2424  T:
2426  T:    BY OPENING THIS CHEST YOU HAVE STARTED A TIME BOMB.
2430  U:*TICKER
2440  T:
2450  T:    BE SURE YOU GET OUT BEFORE IT EXPLODES.
2460  U:*TICKER
2470  T:
2480  T:    THE BLUE SAPHIRE IS HIDDEN AT THE END OF A LONG DEADEND PASSAGE.
2490  U:*TICKER
2500  T:
2510  T:    YOU CAN SEE THE SAPHIRE ANYTIME BY PRESSING "P" TO DRINK THE POTION.
2520  U:*TICKER
2530  T:
2540  T:    BUT BEWARE !!  THE POTION WILL MAKE YOU GRADUALLY GO BLIND.
2550  U:*TICKER
2560  T:
2570  T:                  GOOD LUCK!
```

```
2570  T:                    GOOD LUCK!
2572  C:#FLASKFULL=#TRUE
2574  C:#SAPHIREFOUND=#FALSE
2576  C:#OUT=#FALSE
2580  U:*TICKER
2582  C:#HIDINGPLACE=?\3
2584  C(#HIDINGPLACE=0):#SAPHX=3
2586  C(#HIDINGPLACE=0):#SAPHY=-18
2590  U:*TICKER
2592  C(#HIDINGPLACE=1):#SAPHX=-31
2594  C(#HIDINGPLACE=1):#SAPHY=42
2596  C(#HIDINGPLACE=2):#SAPHX=66
2598  C(#HIDINGPLACE=2):#SAPHY=-23
2600  U:*TICKER
2602  C:#BOMB=1
2604  C:#TIMER=0
2606  C:#DARK=7
2608  U:*DRAWMAZE
2610  U:*PLACETREASURE
2612 PEN 1
2620  C:#RANDOMWALL=?\3
2622  GR(#RANDOMWALL<>0):GOTO 35,40;TURNTO 90; DRAW 7
2624  GR(#RANDOMWALL<>1):GOTO -35,15;NORTH; DRAW 5
2626  GR(#RANDOMWALL<>2):GOTO -70,35;TURNTO 90; DRAW 7
2630 PEN UP
2640  GOTO #TX,#TY; TURTLE ON
2650 *SAPHIRESEARCH
2655     U:*READANGLE
2660     TURNTO #ANGLE
2665     GR(%JO>0):DRAW 2
2670     U(#FLASKFULL):*POTIONCHECK
2675     U(#SAPHIREFOUND=#FALSE):*SAPHIRECHECK
2680     U:*OUTCHECK
2685     U:*TICK
2688     J(#BOMB>31):*EXPLODE
2690     J(#OUT):*END
2695     J:*SAPHIRESEARCH
2700 *POTIONCHECK
2710     AK(%K):
2720     M:P
2730     EN:
2740     C:#FLASKFULL=#FLASE
2750     C:#TURX=%X              [ STORE THE CURRENT TURTLE POSITION ]
2752     C:#TURY=%Y
2754     SETPEN:3,7,2
2760     TURTLE OFF; GOTO #SAPHX,#SAPHY; PEN 3; TURNTO 45; 4(DRAW 2;TURN 90);PEN
P; GOTO #TURX,#TURY; TURTLE ON
2770     E:
2800 *SAPHIRECHECK
2810        C:#DX=#SAPHX-%X
2820        C:#DY=#SAPHY-%Y
2830        C(#DX<0):#DX=-#DX
2840        C(#DY<0):#DY=-#DY
2850        C:#D=#DX+#DY
2860        E(#D>2 ):
2870        C:#SAPHIREFOUND=#TRUE
2880        GOTO #SAPHX,#SAPHY; PEN ERASE; TURNTO 45; 4(DRAW 2;TURN 90); PEN UP
2890        T:YOU GOT IT!
2900        SO:30
2910        PA:20
2920        SO:0
2930        E:
2950 *OUTCHECK
```

```
2950 *OUTCHECK
2960    C(%X>75):#OUT=#TRUE
2962    C(%X<-75):#OUT=#TRUE
2970   E:
3000 *END
3010  QUIT
3020  T:
3030  T(#SAPHIREFOUND):        CONGRATULATIONS!
3032  PA:30
3040  T:
3042  C:#LEFT=(32-#BOMB)/6
3050  T:  YOU GOT OUT #LEFT MINUTE\
3052  T(#LEFT<>1):S\
3054  T: BEFORE THE BOMB WOULD HAVE GONE OFF!
3060  T:
3070  T(#SAPHIREFOUND=#FALSE):  BUT YOU DIDN'T GET THE SAPHIRE.
3080  PA:30
3100  SO:22
3110  C:#TEMPO=10
3120  U:*FANFARE
3900 E:
4000 *EXPLODE
4005    CLEAR
4010    BACKGROUND BLACK
4012    SO:1,2,3,4
4014    PA:2
4020    BACKGROUND GRAY
4022    SO:+1,+1,+1,+1
4024    PA:2
4030    BACKGROUND SILVER
4032    SO:+1,+1,+1,+1
4034    PA:2
4040    BACKGROUND YELLOW
4042    SO:+1,+1,+1,+1
4044    PA:2
4050    BACKGROUND GOLD
4052    SO:+1,+1,+1,+1
4054    PA:2
4060    BACKGROUND ORANGE
4062    SO:+1,+1,+1,+1
4064    PA:2
4070    BACKGROUND PINK
4072    SO:+1,+1,+1,+1
4074    PA:2
4080    BACKGROUND RED
4082    SO:+1,+1,+1,+1
4084    PA:2
4090    BACKGROUND PURPLE
4092    SO:+1,+1,+1,+1
4094    PA:2
4100    BACKGROUND BLUE
4102    SO:+1,+1,+1,+1
4104    PA:2
4110    QUIT
4112    SO:+1,+1,+1,+1
4114    PA:1
4116    POS:5,5
4120    T:BETTER LUCK NEXT TIME
4130   E:
5000 *FANFARE
```

```
5000  *FANFARE
5010   SO:=
5020   PA:2*#TEMPO-1
5030   SO:-1
5040   PA:1
5050   SO:+1
5060   PA:#TEMPO-1
5070   SO:-1
5080   PA:1
5090   SO:+1
5100   PA:#TEMPO
5110   SO:+4
5120   PA:2*#TEMPO
5130   SO:-4
5140   PA:#TEMPO
5150   SO:+4
5160   PA:#TEMPO
5170   SO:+3
5180   PA:4*#TEMPO
5190   SO:0
5200  E:
```

```
 20  C:#COUNTER=1
 30  C:#NUMBER=2
 40  POS:2,5
 50  T:WHAT COMES NEXT IN THIS SEQUENCE?
 60  T:
 70  T:#NUMBER   \
100  *LOOP
110     C:#COUNTER=#COUNTER+1
120     C:#NUMBER=#NUMBER+3
180     T:#NUMBER   \
190     J(#COUNTER<5):*LOOP
200  *RESPONSE
210  C:#NEXT=#NUMBER+3
220  A:#ANSWER
230  T:
240  T(#ANSWER=#NEXT):     THAT'S RIGHT!
250  T(#ANSWER<>#NEXT):    NO, THE NEXT NUMBER IS #NEXT.
```

```
10  *TITLE
20      LETTERS:LARGE
22      SO:11,7,14
30      POS:7,2
32      T:THE
40      POS:5,4
42      T:TREASURE
50      POS:6,6
52      T:OF THE
60      POS:6,8
62      T:SPHINX
70      PA:40
80      SO:-1,=,=
82      PA:120
90      LETTERS:SMALL
100     POS:4,8
110     T:  WHAT IS YOUR NAME, ADVENTURER?
120     POS:8,12
130     A:$NAME
180 R:_____
190 *INTRO
200   T:}
210   U:*EGYPT
220   POS:5,12
230   T:$NAME, YOU HAVE TRAVELED FAR IN AN ATTEMPT TO RETRIEVE THE FABLED GOLD
N SCEPTER OF THE PHAROH.
240   POS:5,17
250   T:YOU HAVE DISCOVERED A SMALL TUNNEL LEADING INTO THE SIDE OF THE SPHINX
260   POS:5,20
270   T:PRESS RETURN TO GO THROUGH THE TUNNEL.\
280   A:
290 R:_____
300 *ANTEROOM
310   T:}
312   U:*ANTEROOMVIEW
320   POS:6,12
330   T:YOU ARE IN A SMALL CHAMBER.
340   POS:2,15
350   T:THREE TUNNELS LEAD OUT OF THE ROOM.
360   POS:5,18
370   T:WILL YOU TAKE THE NARROW TUNNEL, THE TALL TUNNEL, OR THE WIDE ONE?
380   POS:10,22
390   A:
400   M:NARROW,TALL,WIDE
410   JM:*OUTSIDE,*SNAKEPIT,*RIDDLEROOM
420   J:*ANTEROOM
450 R:_____
500 *SNAKEPIT
502   SO:1,2,3
510   T:}
512   T:
520   U:*SNAKEPITVIEW
530  *WAGTAIL
540    PA:5
542    POS:25,14
544    T:!
546    SO:2,5,6
550    PA:5
552    POS:25,14
554    T:\
556    SO:1,3,4
560   J:*WAGTAIL
590 R:_____
600 *OUTSIDE
```

```
600 *OUTSIDE
610     T:}
620     U:*EGYPT
630     POS:5,12
640     T:YOU MADE IT BACK OUTSIDE, $NAME.
650     POS:2,15
660     T:YOU HAVE SURVIVED YOUR ADVENTURE.
670     E:
690 R:_____
700 *RIDDLEROOM
710     T:}
712     POS:5,2
720     T:YOU ARE IN THE PHAROH'S ROOM.  YOU GRAB THE SECPTER, BUT THE SPHINX C
STS A SPELL ON YOU.
722     SO:5,9
724     PA:120
728     POS:5,6
730     T:YOU HEAR A DEEP VOICE THAT SOUNDS LIKE IT IS COMING FROM INSIDE YOU S
Y:
732     SO:4,8
734     PA:130
738     POS:5,10
740     T:ANSWER ME THIS RIDDLE OR YOU WILL DIE!
742     SO:3,7
744     PA:140
748     POS:5,13
750     T:WHAT WALKS ON FOUR LEGS IN THE MORNING, ON TWO LEGS AT MIDDAY, AND TH
EE LEGS IN THE EVENING?
752     SO:2,6
754     PA:150
758     POS:5,17
760     T:YOU HAVE 5 SECONDS TO THINK OF THE ANSWER.
762     SO:1,5
770     PA:300
778     POS:5,20
780     T:NOW WHAT IS THE ANSWER? \
782     SO:0
790     A:
800     M:MAN,PERSON
810     JN:*SNAKEPIT
820     T:}
822     POS:5,7
830     T:CORRECT!  AS A CHILD A MAN CRAWLS ON ARMS AND LEGS.  AS AN ADULT HE W
LKS ON 2 LEGS, \
840     T:WHILE AS AN OLD MAN HE NEEDS A THIRD LEG, A CANE.
842     POS:5,15
844     PA:100
850     T:PRESS RETURN TO RETURN TO THE ANTEROOM.
860     A:
870     J:*ANTEROOM
880 E:
890 *EGYPT
900 T:    ___
```

```
 900 T:        ___
 910 T:       /    \                    /\
 920 T:      |      \              --     /\
 930 T:      |       ------ ___          /   \
 940 T:       --\              \       /      \
 950 T:         |               \     /        \
 960 T:      ___           __     |    --------
 970 T:     /             /       |
 980 T:    |_____|         |
 990 T:                    -------
1000 E:
1200 *ANTEROOMVIEW
1204 T:
1208 T:
1210 T:      ---------------------------
1220 T:      |                         |
1230 T:      |         __              |
1240 T:      |    __   | |     ------   |
1250 T:      |   | |   | |    |    |    |
1260 T:      |    --   | |     -----    |
1270 T:      |          --              |
1280 T:      |-------------------------|
1290 E:
1500 *SNAKEPITVIEW
1510 T:         /\/\/\          _/   \/
1520 T:              |        /
1530 T:         .        .    .-\_
1540 T:                         -\
1550 T:    \_     YOU DIE A SLOW    |
1560 T:    /                          \
1570 T:    |         D E A T H
1580 T:    \/-.                 _/\
1590 T:          BY POISON  .      \
1600 T:   /-\.                       |
1610 T:   |    IN THE SNAKEPIT      \_
1620 T:   \
1630 T:    --.          .             \
1640 T:     -+--_   |    .      /
1650 T:    / .-   -\/.    .--\_/-
1660 E:
```
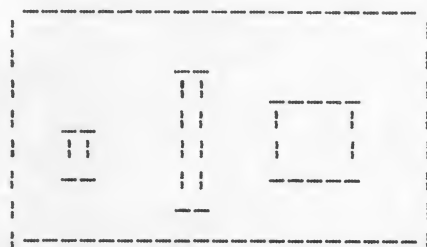
```
 10 C:#OVER=18
 20 C:#DOWN=11
 22 POS:2,22
 24 T:USE THE JOYSTICK TO FLY THE SHIP.
 30 POS:#OVER,#DOWN
 40 U:*SHIP
 50 POS:#OVER,#DOWN
 90 *START
100    J(%JO=0):*START
110    C(%JO=1):#DOWN=#DOWN-1
120    C(%JO=2):#DOWN=#DOWN+1
130    C(%JO=4):#OVER=#OVER-1
140    C(%JO=8):#OVER=#OVER+1
150    C(%JO=5):#DOWN=#DOWN-1
152    C(%JO=5):#OVER=#OVER-1
160    C(%JO=6):#DOWN=#DOWN+1
162    C(%JO=6):#OVER=#OVER-1
170    C(%JO=9):#OVER=#OVER+1
172    C(%JO=9):#DOWN=#DOWN-1
180    C(%JO=10):#DOWN=#DOWN+1
182    C(%JO=10):#OVER=#OVER+1
200 *DOIT
210   U:*ERASE
220   POS:#OVER,#DOWN
230   U:*SHIP
240   POS:#OVER,#DOWN
250  J:*START
500 *SHIP
510     T:\
512     T:\
514     T:
\
520     E:
600 *ERASE
610     T:     \
612     T:     \
614     T:     \
620     E:
```

```
  2  C:#MYNUMBER=87
  5  *GUESS
  8     T:
  9     T:
 10     T:GUESS MY NUMBER: \
 20     A:#IN
 22     T:
 30     T:THE MORE STARS I TYPE THE FURTHER AWAY YOU ARE.
 40     J(#MYNUMBER=#IN):*GOTIT
 50     C:#DIFFERENCE=#MYNUMBER-#IN
 60   *CLUE
 62       T:*\
 64        C:#DIFFERENCE=#DIFFERENCE/2
 66      J(#DIFFERENCE<>0):*CLUE
 70     J:*GUESS
 80  R:_____
100  *GOTIT
102     SO:13
104     PA:10
106     SO:0
108     T:
110     T:CONGRATULATIONS YOU DID IT!
112     SO:18
114     PA:40
120     E:
```

```
 90 *FIRSTCLUE
100     T:WHAT IS ROUND ON THE TOP AND POINTED ON THE BOTTOM?   \
120     A:$GUESS
130     M:CONE
140     JY:*RIGHT
150     T:NO, NOT $GUESS.
155 *SECONDCLUE
160     T:IT'S ALSO SOFT.
170     T:WHAT IS IT?  \
180     A:
190     M:CONE
200     JY:*RIGHT
210     T:THAT'S NOT IT EITHER.
215 *THIRDCLUE
220     T:IT'S SOMETHING COLD AND CREAMY.
230     T:WHAT IS IT?  \
240     A:
250     M:CONE
260     JY:*RIGHT
265 *FOURTHCLUE
270     T:NO.  IT'S SOMETHING GOOD TO EAT.
280     T:WHAT IS IT?  \
290     A:
300     M:CONE
310     JY:*RIGHT
320     T:NO!!
322     SO:1,2,3
325     PA:100
328     SO:0
330    J:*END
340 R:_____
400 *RIGHT
402     T:CONGRATULATIONS!
404     T:
406     T:YOU'RE RIGHT.
410     SO:13
420     PA:8
430     SO:18
440     PA:64
450     SO:0
500 *END
505   T:}
510   U:*CONE
520   T:
530   T:    IT'S AN ICE CREAM CONE.
540  E:
600 R:_____
```

```
 600 R:_____
1000 *CONE
1010 T:
1020 T:
1030 T:                _____
1040 T:              /       \
1050 T:             ¦         ¦
1060 T:            __\       /_
1070 T:           /..\    __/,\
1080 T:          ¦....  /+  \,¦
1090 T:          ¦../ \+++++/
1100 T:          \.._____+++¦
1110 T:          ¦./\\\\\\_/¦
1120 T:          - ¦///////
1130 T:            \\\\\\
1140 T:            /////
1150 T:            \\\\
1160 T:            ///
1170 T:            \\
1180 T:            /
     E:
```

```
110 R:
120 R: This is a mad lib story, using string-variables to store answers to be
sed later in the story.
130 LETTERS:LARGE
140 T:
150 T:
160 T: A ▚▖▖  story
170 PA: 150
172 LETTERS:SMALL
180 *QUESTIONS
190 T:Type in your answers for the following questions.
200 T: A person's name?    \
210 A: $NAME
220 T: A single word description of a person?   \
230 A: $LOOK
240 T: Hair color?  \
250 A: $HAIR
260 T: Favorite color?  \
270 A: $COLOR
280 T: A sign of the Zodiac?    \
290 A: $ZOD
300 T: A piece of furniture?   \
310 A: $CHAIR
320 T: Something soft?  \
330 A: $SOFT
340 T: A favorite food?     \
350 A: $FOOD
360 T: Something to sleep on?  \
370 A: $BED
380 T: A favorite animal?  \
390 A:$BEAR
392 C:$PLURAL=S
394 C:$BEARS=$BEAR$PLURAL
400 U:*STORY
410 E:
420 *STORY
430 T:}
440 LETTERS:LARGE
450 POS:5,5
480 T:$NAME
490 PA: 200
500 LETTERS:SMALL
510 T:     This $NAME is a real $LOOK doll.  Like her hair hangs down to her w
ist.  A natural-born $HAIR, with \
520 T:marble-$COLOR eyes.  But kooky?  Man, this chick is way out!.
530 T:
540 T:     Like the time she breaks into somebody's house.  Just for kicks, she
says.  She's a $ZOD, so always \
550 T:she gets the good breaks.  Nobody's on the scene, so the kid doesn't get
busted by the cops right away.
560 T:
570 T:     This $NAME wanders through the house.  First she grabs a big carved
$CHAIR then another one all $SOFT \
580 T:soft.  But the third $CHAIR is just right.  She flops down in it, and cr
sh!  The third $CHAIR comes apart.\
590 T:Does that make $NAME blow the scene?  Not her!!!
592 T:
600 T:   ▟▙▗▙▘▛\
```

```
 600 T:   ▀▄▄▀▄▀\
 610 A:
 620 T:}
 650 T:        She begins to mess with some chow next.  Does our girl $NAME care?
Not her!  She messes around,\
 660 T: tasting everyone's $FOOD.
 670 T:
 680 T:        The biggest bowl of $FOOD is too hot.  The next-biggest bowl is too
cold.  So what does she want?  \
 690 T: Naturally, the $FOOD in the third bowl.  And being a real slob type, $NA
ME slurps it all down.
 700 T:
 710 T:        So she cases the bedrooms next. The big $BED is too long.  The midd
e-sized $BED is too wide.  But--\
 720 T:the third $BED looks just right for this dumb dame.
 722 T:
 730 T:   ▀▄▄▀▄▀
 740 A:
 750 T:}
 760 T:        She crawls into it.  In a split sec, she's in--you guessed it--Snor
sville.   Tromp, tromp, tromp! The\
 770 T: family's coming back.
 780 T:
 790 T:        Big Daddy and Fat Momma stand there in their fur coats, their eyeba
ls bulging out.  Chunky Brother \
 800 T:stands there in his fur coat, yelling.
 810 T:
 820 T:        Then $NAME opens her marble-$COLOR eyes and sees the three furry fc
ms.  She begins to scream.
 830 T:
 840 T:        "$BEARS!"  $NAME is screaming. "Save me!  Save me!"
 842 T:
 850 T:   ▀▄▄▀▄▀
 860 A:
 870 T:}
 880 T:        "Throw her out!" yells Fat Momma
 890 T:
 900 T:        "Beat it, $HAIR!" shouts Big Daddy.
 910 T:
 920 T:        "Hold it, folks!  Maybe this chick's just a mixed-up kid," coos Chu
ky Brother.
 922 T:
 930 T:   ▀▄▄▀▄▀
 940 A:
 950 T:}
 960 T:
 970 T:        "Oh, yeah?" screams Fat Momma.  "Then I'll just straighten her out
ood!" So Fat Momma kicks her out \
 980 T:the door.
 990 T:
1000 T:        Even a dame as dumb as $NAME gets the message.  With Chunky Brother
taking her out every night, she \
1010 T:changes her life-style to good-as-gold.
1020 T:
1030 T:        And knocks off house breaking forevermore.
1040 T:
1050 T:
1060 T:              THE END
1070 E:
```